CQ

September 1976
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The Old And The New

*See OH2BH's New Approach...page 21

The Radio Amateur's Journal

Heathkit Transceivers

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THE SB-104. Acclaimed as the world's finest Amateur Transceiver. For features and operating convenience, for specifications and performance, you simply won't find a better transceiver than the SB-104. Completely solid-state, totally broadbanded, TRUE digital readout with resolution to 100 Hz! Instant QSY – choose the band, dial the frequency, select your mode and go – no more preselector, load or tune controls. The transmitter delivers 100 watts output and, for QRP'ers, a front panel switch selects 1 watt out. The signal is clean and strong, with harmonic and spurious radiation below 2 μV, third order distortion down 30 dB and unwanted sideband suppression down 55 dB. Receiver sensitivity is 1 μV for 10 dB S+N/N; selectivity is 2.1 kHz at 8 dB down. There's a 15 MHz WWV position on the bandswitch; 30 kHz per revolution spinner knob; tune button for loading linears; ALC/relative power/"S" meter and more. The SB-104 operates directly from a 12-volt electrical system; for fixed station operation, use the HP-1144 power supply.

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KIT HP-23B $57.95

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KIT HP-13B $84.95

400 Hz CW Crystal Filter.
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AM-336

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SEPTEMBER, 1976 VOL. 32, NO. 9

The Radio Amateur's Journal

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KENWOOD'S TS-820 *the Pacesetter*

KENWOOD HAS ATTAINED A HIGHER LEVEL OF ACHIEVEMENT IN ITS TS-820 THAN EVER REACHED BEFORE. THE DISCRIMINATING AMATEUR WHO WANTS THE VERY BEST NEED LOOK NO FURTHER NOR WAIT ANY LONGER. THE TS-820 PACESETTER" WILL PROVIDE SUPERIOR PERFORMANCE, VERSATILITY AND FEATURES FOUND IN NO OTHER TRANSCEIVER.

THE NEW "PACESETTER" IS THE ULTIMATE PROOF OF KENWOOD'S DEDICATION TO OFFERING ONLY THE VERY FINEST.

What makes the TS-820 the Pacesetter: Full 160-10 band coverage, QRM-killing IF shift, true R.F. speech processor, husky AC power supply, state-of-the-art PLL VFO system, rugged final amplifier, RF negative feedback circuit . . . all this and more built in to make the TS-820 the Pacesetter that it is.

We haven't forgotten the other standard Kenwood features either . . . efficient noise blanker, 25 kHz calibrator, built-in speaker, CW Sidetone and semi-break-in circuits.

Let's take a closer look at some of these important features. This month the Digital Readout:

The Digital Display Readout directly indicates the transmit and receive frequencies by counting the carrier, VFO, and hetrodyne signals. Unlike dials using a VFO signal only, it indicates the accurate frequency in any operating mode. The readout accuracy is determined by the standard 1 MHz oscillator which is calibrated to WWV. The counter actually figures the frequency down to 10 Hz and the digital display reads out to 100 Hz. Frequencies are displayed in Kenwood blue digits for long operation without fatigue.

When the Digital Display is installed, the D.H. (display hold) switch is used as a memory device. By pressing the switch, the selected frequency will remain displayed.

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TS-820 *Specifications*

FREQUENCY RANGE: 1.8-29.7 MHz (160 - 10 meters)
MODES: USB, LSB, CW, FSK
INPUT POWER: 200W PEP on SSB
160 W DC on CW
100 W DC on FSK
ANTENNA IMPEDANCE: 50-75 ohms, unbalanced
CARRIER SUPPRESSION: Better than 40 dB
SIDEBAND SUPPRESSION: Better than 50 dB
SPURIOUS RADIATION: Greater than -60 dB (Harmonics more than -40 dB)
RECEIVER SENSITIVITY: Better than 0.25uV
RECEIVER SELECTIVITY:
SSB 2.4 kHz (-6 dB)
4.4 kHz (-60 dB)
CW* 0.5 kHz (-6 dB)
1.8 kHz (-60 dB)
*(with optional CW filter installed)
IMAGE RATIO: 160-15 meters: Better than 60 dB
10 meters: Better than 50 dB
IF REJECTION: Better than 80 dB
POWER REQUIREMENTS: 120/220 VAC, 50/60 Hz, 13.8 VDC (with optional DS-1A DC-DC converter)
POWER CONSUMPTION: Transmit: 280 Watts
Receive: 26 Watts (heaters off)
DIMENSIONS: 13-1/8" W x 6" H x 13-3/16" D
WEIGHT: 35.2 lbs (16 kg)

additional *Features*

FINAL AMPLIFIER: The TS-820 is completely solid state except for the driver (12BY7A) and the final tubes. Rather than substitute TV sweep tubes as final amplifier tubes in a state-of-the-art amateur transceiver, Kenwood has employed two husky S-2001A (equivalent to 6146B) tubes. These rugged time-proven tubes are known for their long life and superb linearity. Tubes run cool with the aid of a noiseless fan (standard) mounted on the rear panel. The above tube and power combination minimizes the possibilities of TVI and helps to maintain the Kenwood reputation for excellent audio quality.

Most modern SSB transceivers employ some type of ALC circuit in the final stage. The TS-820 uses R.F. negative feedback from the PA plate circuit to the driver cathode permitting a high degree of linearity at the high power level of the PA tubes. This accomplishes third order intermodulation products 35 db or greater below the output signal . . . you get one of the cleanest signals on the air today.

VFO-820

The VFO-820 is a solid state remote VFO designed exclusively for use with the Kenwood TS-820 Pacesetter. The VFO-820 has its own RIT circuit and control switch. It is fully compatible with the optional digital display in the TS-820. The perfect extra to any Pacesetter station.

CW-820
500Hz CW Crystal Filter

TV-502
The TV-502 transverter puts you on 2-meters the easy way. Simply plug it in to the TS-820 (or TS-520) and you're on the air. Operates in the 144.0-145.7 MHz frequency range with a 145.0-146.0 MHz option.

Zero Bias

Our cover this month depicts both the old and the new. The background montage are photo's supplied by the Antique Wireless Association of their Museum display at Holcomb New York. The inset photo shows Martin Laine, OH2BH's station in Finland. You can read Martin's story on page 21. The good old days seem somehow more desireable in that they appeared to be less confusing, more structured and filled with the adventure of new worlds to discover. Somewhere along the way, these new worlds became too much of a threat and conservatism set in, lets keep things the way they are, hold the line against the onslaught of change.

The other day I received what started out to be an irate phone call from one of our readers objecting to an ad in the August issue. The ad in question was aimed primarily at CBers and offered a remote PA speaker that could be added to their rigs (or amateur equipment for that matter). The caller made the assumption or accusation that *CQ* had turned or was about to turn into a CB publication. Somehow the idea occurred that *CQ* would "sell out" amateur radio in favor of CB. Ordinarily this position would not warrant defending or explaining in the light of our publishing company. *CQ* magazine is part of Cowan Publishing which for the past 14 years (yes I said 14 years) has succesfully published the leading journal devoted to CB enthusiasts, *S9* magazine. Be that as it may, there is no master plan to convert *CQ* to a CB magazine. Nor is there a blanket policy to advocate or promote CB in the pages of *CQ*. On the contrary, we have been promoting *CQ* and amateur radio in the pages of *S9*.

This call along with many letters I have been receiving lately with respect to modifying the FCC licensing structure makes me wonder about just what it is we're discussing when we talk about amateur radio. Amateur radio as well as the FCC is by no means sacrosanct. We do not hold our licenses or frequencies by divine right or federal treaty and certainly not by private ownership. We need not be paid back in kind for any loss incurred to our frequencies by right of eminant domain. We can and sometimes do yell and scream about injustices, actions that we feel personally threaten "what is ours" and grumble and raise our hackles concerning "them". Well *CQ* is not going over to "them" for several reasons. First and foremost is that "they" don't want or need us.

Judging from what I hear and read we in general are upset and vehemently opposed to "them". We are not going out of our way anymore to attract "them" to the wonderful world of amateur radio. "They" break laws, are disrespectful of tradition and somehow fail to genuflect at our tremendous benevolance. Oh how we tried to show "them" the error of their ways. Well rest assured, "they" really don't want too much to do with us. "They" have pretty much what they want and will probably get more later on. "They" don't spend nearly half the time thinking of us that we devote to "them". What "they" have is another problem, not unlike ours but handled differently.

This is what would be called in the chemistry lab, allotropy. A certain property that some chemical elements have of existing in two or more different forms such as carbon in charcoal and carbon in diamonds . . . it's still carbon. We as amateurs lately have taken the attitude that the way to increase our membership is to soften the licensing procedure and eliminate traditional examination criteria as this was felt to be too exclusionary. I'm not at the moment trying to weigh the merits of this arguement but just to state it. This then comes down to saying that if the exam is too tough or people cannot for whatever reason study and learn enough to pass it then circumvent it by making it easier and more palpable. Don't change the people, change the exam. "They" on the other hand are saying "I'm doing what I want to do, I talk to who I want to, I'm accomplishing what I set out to do. The examination is too tough and meaningless, I don't really want to be part of those 2 to 300,000 or so people who can't seem to make up their own mind but want everything. Here I am minding my own business crowded into a small space with 15 or 20 million other people and I want more." One tries to discount the law and the other, seemingly disregards it. Both want room to communicate.

The foreseeable stop-gap will be the Communicator Class of licenses. We welcome it. This will not deplete the CB ranks nor foul up amateur radio. This will give amateur radio a needed shot in the arm. New blood surging through our clogged veins will once again make amateur radio a viable industry, fill some unused spectrum and take us down a peg or two. It's a brand new start, an infusion of life sorely needed and a logical counterbalance to the dreaded "them". It even may bring about a time when some of us can even own up to using CB. It's a buffer whereby people can travel from both camps to see the other in some neutral context. We don't have to shove amateur radio down "their" throat and choke "them" till "they" see the light. We did a pretty poor job of it the last time, let's not do it again. As I have been saying, we're not in the catbird seat anymore, we are a minority that still speaks for various personal interests rather than for the total of amateur radio.

To go back to the start of this editorial then and try to pull together some meaning to it is in a way to form a plan for the future. The future *will* hold a Communicator Class License. This will bring into our ranks certainly many more times the numbers of amateurs than presently exist. We, the dinosaurs of a changing time, can adapt to this change and prosper instead of dying off of short-sightedness. The changes, as with evolution, are slow and subtle but changes they are. We will be faced with an influx of people who by definition will not be as technically versed as some of us nor as steeped in lore and vernacular dating back and back and back. To ignore or scoff is to ultimately perish, to teach and provide is to grow.

So to answer my not-so-irate caller, we at *CQ* will not be selling out to "them" but rather buying up more of US. We plan to feature more sections and articles of basic information and if called for other aspects that appeal to our readers. This will not be done at the expense of our regular columns or programs and will not take the place of traditional technical articles but will mean an influx of broad based material of general interest. We intend to grow and expand with amateur radio. . . come on along.

73, Alan, K2EEK

"They don't make 'em like they used to..."

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The new ultra-modern fully solid-state TRITON makes operating easier and a lot more fun, without the limitations of vacuum tubes.

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TRITON IV $699.00

ACCESSORIES:

Model 240 One-Sixty Converter	$ 97.00	Model 245 CW Filter	$ 25.00
Model 244 Digital Readout	197.00	Model 249 Noise Blanker	29.00
		Model 252G Power Supply	99.00
		Model 262G Power Supply/VOX	129.00

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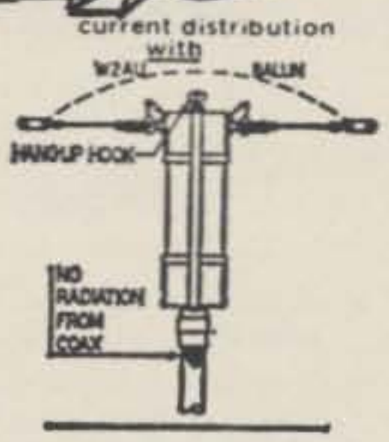

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Our Readers Say

Note on Audio Powered Noise Clipper (CQ, May '76, p. 26)

Editor, *CQ*:

Having been interested in the audio type noise limiter for many years I built this one at once. For an outboard gadget, that does not require any receiver modification, it definitely deserves high praise. Spark interference from an elevator motor could be practically eliminated, when the control pot was advanced far enough.

These noise clippers are high impedance devices as I pointed out in my article (*73*, Aug. '65) on a much less effective diode clipper, and suitable input and output transformers are absolutely necessary. The sound quality (plus some insertion loss) was much improved when I replaced the skimpy Archer transformers with 6 volt filament transformers connected in reverse. The necessary box will have to be somewhat bigger, but for an outboard device, who cares.

I was unable to buy HEP 134 or 135 diodes, but found the type 1N273 offered by mail from Poly Paks most satisfactory. These are listed in their catalog 216-A as signal diodes no. 92CU2066 (4 (40 v. inv., 200 mils) at $1.00 for 10 plus postage.

Paul G. Stecher
Westwood, N.J.

Keeping Pace

Editor, *CQ*:

This is a CQ to all hams who are cardiac pacemaker wearers! Many letters to the ham journals indicate a growing need for information about (EMI), electromagnetic interference, especially as it relates to ham operating. Pacemaker wearers generally do not have access to reports of susceptibility tests made by military or federally sponsored (FDA/BRH) testing programs. As a result, the lack of relevant information leads to confused, and often erroneous 'advise' from well meaning individuals. As a pacemaker wearer since April 1975, and a ham since 1924, I have been compiling interference data in an effort to: (1) know my own operating limitations, and (2) to help other hams with pacemakers who are staying off the air because of fear of failure or abnormal behavior of their pacemaker caused by radiation from their rigs. Will any reader who wears a pacemaker write me and describe any experience, and to elicit the maximum information, I have prepared a short questionnaire which is available for an SASE. This is a worth while project, but many answers, from as many hams as possible, are needed. For a postage stamp and a little bit of your time the information you provide might help to get a fellow ham back on the air. Please get involved . . . your help is needed . . . QRU?

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. . .a VHF/FM mobile transceiver for the 2 meter amateur band. It is compact, ruggedly built and completely solid state. One channel supplied plus two channels of your choice FREE

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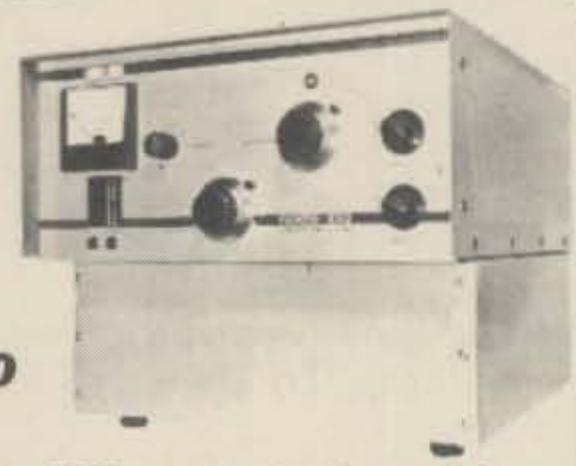

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2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159

UHF (400 to 512 MHz)

Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
2W	40W	40D02	$180
10W	40W	40D10	$145
2W	10W	10D02	$125

FCC Type accepted models also available.

Most of the above products are available at dealers throughout the U.S.

Henry Radio

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Announcing

• **Vienna, VA** – The AMRAD Computerfest will be held on October 24, at the Vienna Community Center, 120 Cherry St., near Exit 11S of the Washington, DC Beltway. Admission will be $4.00 at the door ($3.50 advance registration). The exposition will be almost entirely devoted to small computers of the type suitable for home use. For more information write: Computerfest, P.O. Box 682, McLean, VA 22101.

• **Kalamazoo, MI** – The 22nd Annual VHF conference will be held at the Western Michigan University on October 9th at the 1 & ET Building. Activities include Swap and Shop, Workshops, Technical Sessions, Dinner & Speaker. For more information write: Dr. Glade Wilcox, Chm. W9UHF/8, Dept. of Electrical Engineering, Western Michigan University, Kalamazoo, MI 49008.

• **Erie, PA** – The Radio Association of Erie will hold its fall Hamfest and Flea Market on Saturday, October 9th at the Kuhl Hose Company Grounds on PA Rte. 8, 1 1/2 miles south of I-90. Admission is free with a $1.00 per car charge for the flea market. The times will be from 10:00 AM until 4:00 PM with a dinner to follow at 6:00 PM. For more information write: RAE; Box 844, Erie, PA 16512.

• **St. Paul, MN** – The '76 ARRL Dakota Division Convention will be held on October 1-3 at the St. Paul Civic Center, 143 W. 4th St. Activities include: Talk-in Station, F.C.C. Exams, Wouff Hong, Technical seminars, ARRL Forum, Ladies Program, Prizes, Large exhibit area and a full-course banquet. For more information write: St. Paul Radio Club, P.O. Box 30313, St. Paul, MN 55175.

• **Hartford, CT** – The annual GIDEP workshop, Government-Industry Data Exchange Program will be held on October 20-22 at the Sheraton Hotel. For more information write: Rathin Neogy, Hermes Electronics Limited, P.O. Box 1005, Dartmouth, Nova Scotia, Canada B2Y 4A1.

• **Plymouth, IN** – The Marshall County Amateur Radio Club swap-n-shop will be held on Sunday October 31, at the Plymouth, Indiana National Guard Armory, 1220 W. Madison St. from 7:00 a.m. to 4:00 p.m. Talk-in on 146.07-67 and 146-94 simplex. Free tables, no charge for set-up. Tickets $2.00 at door. Food, drink, Door prizes. For more information contact WA9INM Rte. 3 Box 526, Plymouth, IN 46563.

• **Lexington, KY** – The Central Kentucky Hamfest will be held on October 3rd at the Countryworld Convention Center on I-75 between Lexington and Georgetown, KY. Grand and Door Prizes, Indoor flea-market; talk-in on 146.16-76. Admission $2.50 in advance $3.00 at door. Doors open at 8:00 am. For more information write: Hamfest, Box 4411, Lexington, KY 40504.

• **Syracuse, N.Y.** – The Radio Amateurs of Greater Syracuse will hold their 1976 Hamfest on October 9th at the Syracuse Auto Auction Inc. 4 miles South of Syracuse on N.Y. Rte. 11. Activities include Talk-in 31/91, Flea Market, Exhibitors, Speakers. Tickets $2.00 ($1.50 in advance.

• **Aruba, Netherlands Antilles** – The Aruba Amateur Radio Club, PJ3ARC announces a QSO party from October 1 up to and including October 31, called "A.S.A." party or 'Aruba Salutes America" party, in which only the U.S.A. and its possessions can participate. During said period every ham in the U.S.A. who can make contacts with 3 PJ3 stations will receive a special A.S.A. certificate together with an A.S.A. QSL card. For application only a letter, a QSL-card or copy of the log, stating the 3 worked PJ3 stations will be sufficient. Any band one band or combination as well as any mode (SSB, CW or RTTY) or combination is allowed. For more information write: Aruba Amateur Radio Club, P.O. Box 273, San Nicolas, Aruba, Netherlands Antilles.

• **Cedar Rapids, IA** – The Cedar Valley Amateur Radio Club Hamfest will be held on Sunday, October 3. ARRL Representation. Held at Hawkeye Downs Exhibition Building. Camping, Talk-in, Prizes. Tickets $1.50 advance $2.00 at gate. For more information write: CVARC Hamfest, P.O. Box 994, Cedar Rapids, IA 52406.

• **Metairie, LA** – (New Orleans Suburb) The New Orleans Hamfest and Computer Fest, sponsored by the Jefferson Amateur Radio Club, will be held October 30-31 at the Archbishop Rummel High School, 1901 Severn Ave. Forums on computers, AMSAT, MARS, RTTY, QRP, novices and beginners and antennas. Banquet, Talk-in on 146.34-.94 and 3.95 mHz. For more information write: Dominick "Nick" Tusa, WA5RMC, chairman, New Orleans Hamfest, P.O. Box 10111, Jefferson, LA 70181.

• **Teen Net** – On Thursday afternoons at 2030 UTC including the midwest region of the U.S., and the frequency will be 3920 kHz.

STOLEN EQUIPMENT

Drake TR-72 2 Meter FM, SN 750228. Has following crystals installed 52/52, 58/58, 25/85, 37/97, 34/94, 04/64, 07/67, 31/91, 28/88, 16/76, 01/61, 19/79 and 22/82. Locked bracket was with rig when stolen from car in Arvada, Colo. on June 18, 1976. Stolen from: Ron Bradley, WB0OES, Arvada, CO. (303) 421-3549.

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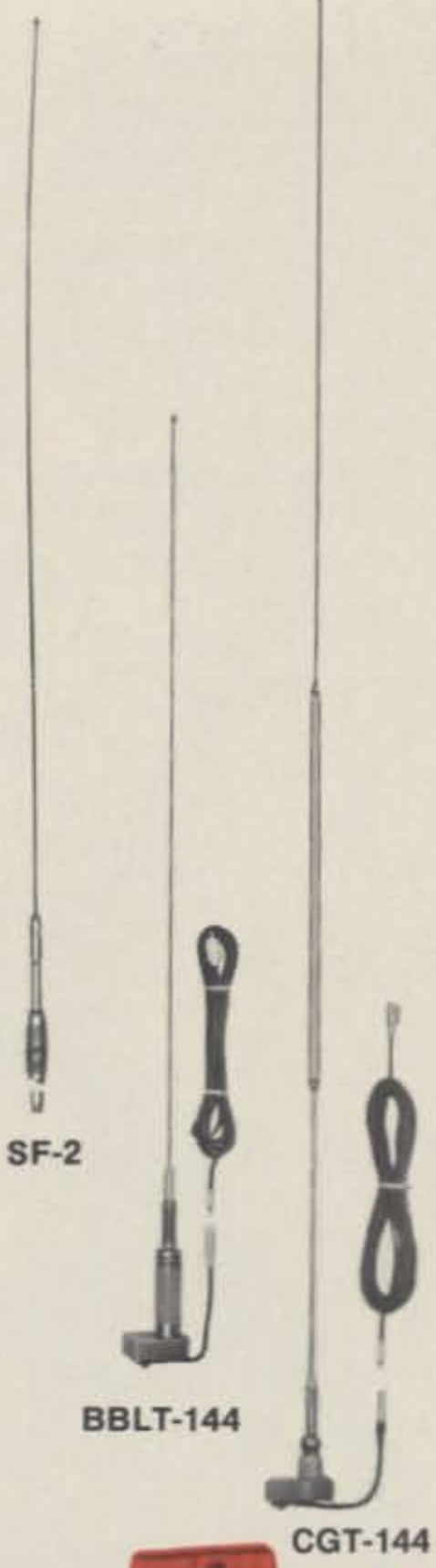

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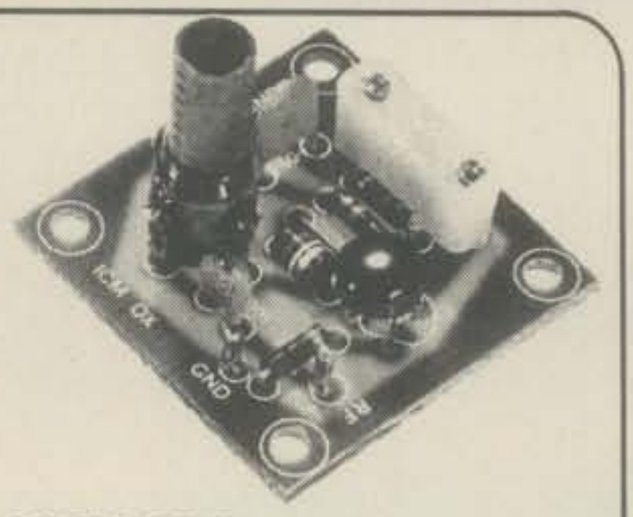

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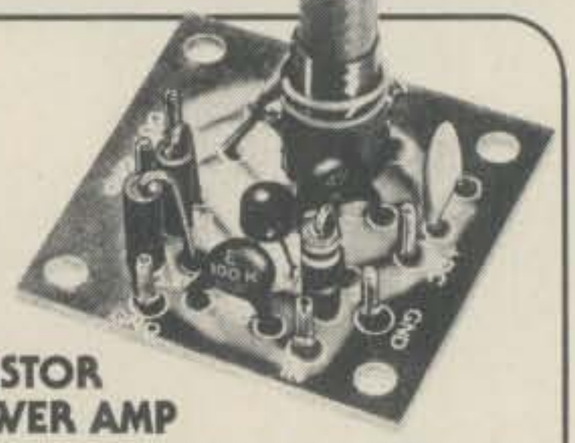

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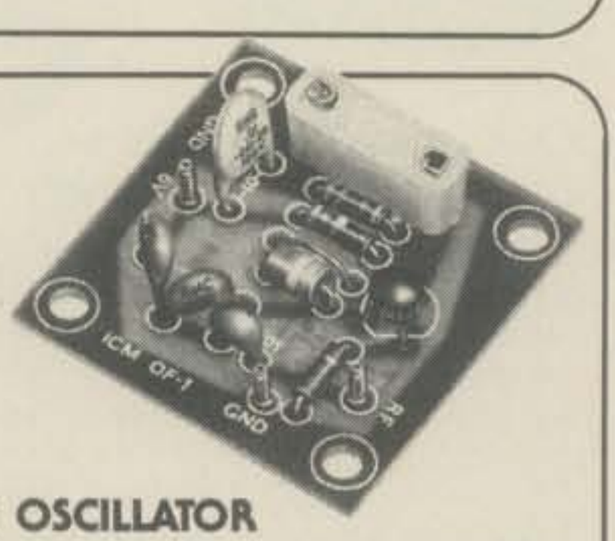

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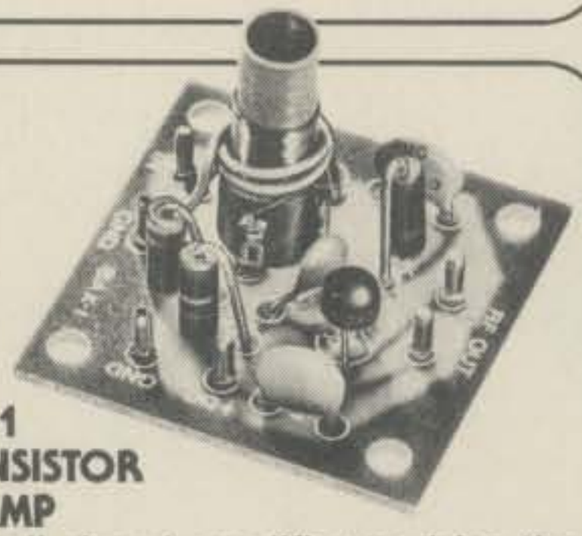

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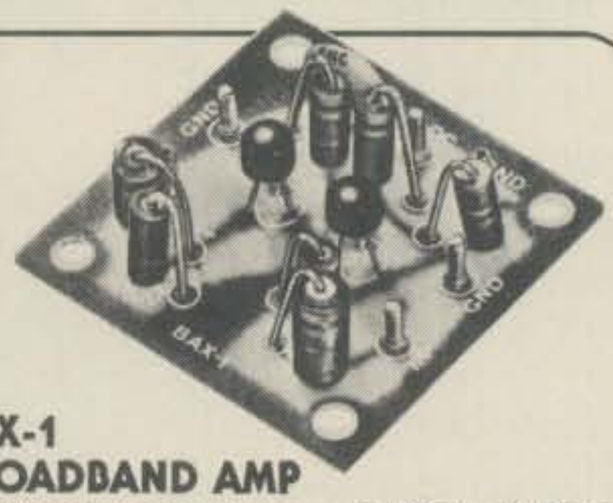

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DXpedition To Tonga And Niue Islands

BY BILL RINDONE*, WB7ABK

After four times around the world, an all night flight certainly was neither new nor novel. I had left Portland during the late afternoon and been entertained at the Honolulu Airport by Lee Wical, better known to most as KH6 Blooming Zipper Flipper. Lee had apologized for the lack of dancing girls and handed me his blank business card, it was obviously going to be a long night! During this five hour layover, Lee explained that among other endeavors, he is employed by a government agency which deplores advertising.

At 2:00 a.m., replete with ten pounds of Macadamia nuts, I boarded the flight for Pago Pago. My hand luggage now weighed seventy-five pounds and was at least partially edible. Have you ever watched a 38 year old man waddle his way up to an airline ticket counter with four pieces of luggage, check two of them—the lightest ones of course—and then casually lift the other two "carry ons", so that they would outwardly appear to weigh less than ten pounds, while inwardly he felt both of his arms slowly stretch to a length which was three inches longer than his shirt sleeves? It became painfully obvious that after a few weeks of this, I would have to be extremely careful not to step on my finger tips.

The flight to American Samoa, and the ensuant interisland taxi flight to Western Samoa, were uneventful. Now came the first big test, customs. What would the first reaction be to a hand bag full of electronics equipment with coaxial cable, which bore a distinctive resemblance to cordite fuse all coiled and primed? I was to learn that customs

Like Captain Cook, Bill Rindone, WB7ABK, proclaims this land for amateur radio. The pennant he is flying is the 3 element tribander while his foot rests on a handbag packed with a TS-520 transceiver, log sheets and 100 foot of coaxial cable. The Curtis keyer and paddle normally fit inside.

*3049 Doris Ct., Lake Oswego, Oregon 97034

agents who eat Macadamia nuts, do not inspect baggage, nor do they ask many questions with their mouths full. "Anything to declare?" became a standard question, "Just a radio" became the answer. Faeleolo Airport and I were old friends from years past, and although modernized, the friendly people remained the same.

I caught a cab out to 5W1AU, Phil Williams home and found Pete, 5W1AZ on the air answering queries as to my whereabouts. I had managed to get all of my gear on board a five passenger interisland flight and was arriving when least expected. Phil arrived shortly and the usual war stories were exchanged.

Phil is a flight engineer with Polynesian Airways and after dinner suggested that we view the local "watering holes". He felt that this was the opportune time, as the number of local establishments had just been reduced from twenty-eight to a mere twenty-seven, and the possibility of a guest missing another one, due to delay, was entirely too great. Not wishing to displease my host, I quickly showered and changed into some fresh clothing. As we were about to depart, I felt a strange scratching sensation within my trousers. Reaching within, I found a small slip of paper with what I recognized as my wife's handwriting. Unfolding it, I read it aloud; "Hi there! Bears have been known to get their heads stuck in the honey pot. Please keep yours on straight. Love, Dee". This brought the roof down, but was to be only one of many such notes scattered throughout my luggage. The last one was to be found 51 days later in Nepal. This evening was necessarily short, as I had to make an early flight to Tonga on the morrow.

Though not in the deepest jungle, the operating position at the Dateline Hotel in the Kingdom of Tonga was not without its hazards. Just rotating the beam seemed to rival the efforts of Tarzan.

Aside from being Polynesias' last kingdom, Tonga is an area best depicted by its' secondary title as "The Friendly Islands". Centuries old rituals still persist among the thirty-six inhabited islands, and although the Kingdom of Tonga extends over 600 miles in length, it contains only 269 square miles of land, spread out amongst 150 islands. We operated from the capital city of Nuka Lofa on the island of Tongatapu, which contains approximately 60% of the countries population.

After arriving in "downtown" Nuka Lofa, we made our first stop at the local P.T. & T., where I was advised that a license would be issued after a three to four week wait. Further that it would be physically impossible in less time as the Radio Superintendent would be away that long. After a short discussion regarding the departure of the next flight, I was issued A35NN and my thanks go to the interim Radio Superintendent who cut all the red tape and issued this out of sequence call sign. I later found out that Tonga was "between" radio officials, and that this chaps term of duty was just one month, and further, that he had never issued an amateur license before. I had chosen the call-sign A35NN for the upcoming ARRL CW DX Contest. Sending the contest exchange as 599 with a wattage of 99, followed by A35NN gave us a distinctive "5NN NN de A35NN" sound. The contest was now less than twenty-four hours away and I still wasn't set up to operate.

After a short discourse on the subject of amateur radio, I managed to get the only vacant room at the Dateline Hotel and started erecting antennas. The hotel has three floors, with an elevator shaft on the fourth and fifth. Above this is a flag pole and it was only fitting that in this bicentennial year it was to fly a three element, tri-band yagi, pointed at the United States. The 40/80 meter dipole was stretched between stanchions and the end casually thrown down over a tree. The only real problem was that in order to turn the beam it was necessary to climb (short for "run") two flights of stairs, an additional sixteen feet of steel ladder on the outside of the elevator and shinny up the flag pole. After dark, it succeeded in being great sport, and provided entertainment for the local people and other hotel guests, who gathered around to see the latest in American fanaticism. The temperature was between 95 and 100 degrees and it played tag with the humidity for top billing, twenty-four hours a day. When I left home the temperature had been running in the mid-forties and the change was, indeed, noticeable.

Finally we were all set and fired off on twenty meters. The first contact went to K0HWB on c.w. and a check of the other bands found all of the antennas in good working order. Propagation is very different in the A35/ZK2 areas and bears little resemblance to the openings in nearby Samoa. Eighty meters turned out to be a dream and we had over 450 stateside QSOs on that band. Ten

meters was also very good and most areas of the world had propagation to us, needless to say, we had a pipeline to JA land and the frenzy on fifteen meters would have put an Irish wake to shame. Biggest 75 meter signal went to W8LIO who knew he owned the frequency when he pushed his mike button. With a number of dx-operations in past years, signals don't normally stick in my mind, this one did.

After six days of operating, I pulled the switch at about 2:00 a.m. local time and began dismantling antennas, eighty feet above ground in the dark. Surprisingly, everything was there when I started to set up twelve hours later on Niue.

The flight to Niue is an interesting one, as it is a "once-a-weeker" from Tonga, which originates in Western Samoa and terminates there also. You fly a counter-clockwise path and can only fly to Niue via Tonga, to depart Niue, you must fly to Western Samoa, which is where the flight started from, and you can not fly it via the opposite direction since there is no such flight. If this sounds confusing, try flying it with the additional knowledge that when it's Thursday in Samoa, you arrive Friday in Tonga and back to Thursday in Niue. At any rate, I was back on the air from Niue, six hours before I closed the station down on Tonga.

Niue, or Savage Island as it was first named, is located about 400 miles northeast of Tongatapu. It is a single, lone island which encompasses about 100 square miles of land at 19° South latitude and 170° West longitude. It was discovered by Captain Cook in the year 1774, however, the first European settlement was not established on the island until the 1860's. The local Niuans are related to the Tongan people, but have evolved their own culture down thru unrecorded history. The government is autonomous in nature, but, still financially dependent in some respects to New Zealand. The current population is around 3800 and it's first and only hotel was completed at this time last year. The Niue Hotel is an outstanding structure of modern design, which is complete in every respect except for tourists to occupy the twenty available rooms. At the time of our visit there were only four other people using the facilities, and one of these was in temporary residence, while on loan from the New Zealand government. The hotel is situated on a one hundred foot cliff overlooking the Pacific Ocean with a 200° water path open in all important directions.

When I had finished clearing customs with my "portable radio", I asked the first available person directions to the local P.T. & T. The responding finger pointed some six feet away to Owen Murray, whom, I was quickly to learn, was the local Radio Superintendent. Owen, is an extremely likeable chap and was at the airport to meet Chris Linnell, G3VLT, who is employed with the United Nations and who was on Niue to give advice on the local government radio installations. Sixty seconds after meeting Owen, the details of the license had been arranged and some sixty minutes later Owen was visiting me at the hotel and handing me the permit for ZK2AQ along with a bill to pay downtown, sometime, before I departed the island. On Niue "downtown" is sufficient address for most anything, as the post office could probably deliver mail with a sling shot, if it put its' mind to it.

The antenna doing its thing at ZK2AQ. It is also shown in the drawing done of the Niue Hotel.

Chris, G3VLT, had been off the air for a couple of years and was delighted to find another amateur on the island. In celebration of his arrival a small feast was being held, it went off on schedule without the guest of honor, who had elected to help assemble and erect the expeditions triband yagi beam. Having performed the operation several times, it takes exactly two hours to set up or tear down the station, including packing. With the luxury of another hand to help, the time passed rapidly and we soon had the beam mounted on a twenty foot section of pipe and secured into place. We stretched the dipole between the building and a tree, and we were prepared to light off ZK2AQ.

We had 3000 contacts in six days from A35NN and we were to duplicate this effort from Niue. Whenever he could, Chris was on hand and seemed to relish logging the QSO's. More then once I asked him to sit down and operate for awhile, but, he always smiled and passed up the opportunity.

Once again I found the bands to be in reasonably good condition, and despite two solar flares which cut us off from the rest of the world during the CQ SSB WPX Contest, worldwide openings did occur for us. Ten meters was good to most areas and the ten meter band was open till past midnight into Asia. Fifteen meters was good into Europe until about 2:00 a.m. local time, although signals were

The interisland taxi flights are by way of South Seas Airways.

weak. Eighty played tricks on us and only opened for long range communications on two evenings during our stay, but, the boys were there waiting on us when it did open and the contact ratio was high during these periods. In the CQ WPX Contest I had 1600 contacts in 30 hours of single operator work. The multi-op boys at VR8D and 5W1AZ were up in the 3000 contact bracket, and during one solar blackout the three of us sat and ragchewed about multipliers while we awaited the reopening of the paths. Think I will probably always remember the YS1 who called a very sophisticated CQ DX, and then almost choked to death trying to answer our reply.

Niue is literally infested with flies and insects, if it creeps, crawls, wiggles or flies, it will find you in record time. The mosquitoes enjoyed foreign delicacies and if we didn't qualify as an hor d'oeuvre, then it only meant that we were scheduled for the main course. The light above my operating position attracted them to the feast and I finally turned the tables by spraying the light with DDT. The first whiff killed over a thousand and they all fluttered down upon the gear. While I was debating how to get rid of them, the ants, who're not affected, solved my problem and by doing so provided nightly entertainment. While operating, I would watch a dozen ants roll a small bug over, station one of their kind at each corner, lift on the count of three and gently trot away with their prize. Occasionally, I would lift a coaxial cable which was impeding their path and receive a warm ovation from my friends . . . it was the least I could do for six evenings of entertainment.

On the serious side, there seems to be a strange mis-conception amongst DXers that the operator on a DXpedition is really having a super good time. Expeditions are damned hard work under difficult conditions. Twenty hours of operating a day is the norm for me, with bad food, 100° heat, 95% humidity, mosquitoes, two inch roaches, four inch spiders, governments that don't like hams, and people who don't like outsiders. I've had malaria, amoebic dysentery, body ulcers, viruses, 105° fevers and a few others, that they don't even have names for. In the past, I have been surrounded by armed guerrillas, carried gear into warring countries, flown with bush pilots, sailed through full gales and been accused of being an American. I've slept on dirt, boards, floors, ship decks, airplanes and been awakened by unfriendly natives, explosions, storms, lizards, gunfire and leopards trying to get into my quarters. There are at least another hundred things that I have insufficient space here to tell about, or have been asked not to mention. Ten percent of it is "fun", ninety percent is work.

The chap on the other end expects an efficient, courteous operation, as it should be. Others, expect fast QSL service, conversion of "daylight standard time", a three day search of the log for their QSO, a card for a non-existent contact, special operating considerations, immediate band or mode QSY's, 5-9 reports for S-5 signals, multiple contacts on the same band and mode, and to be allowed the privilege of being just plain rude.

The DX operator who is mentally alert, courteous, complimentary, uses precise tail ending, tunes up off frequency, gives his call only once, doesn't call when he can't hear or when his area isn't being asked for, is my kind of guy. For he and his kind, my hat is off and I'll do my damnedess to get him a contact.

On March 31st 1976, at 13:16 GMT, we tore the station down, bid a fond adieu to the ants and headed for Christmas Island in the Indian Ocean. ■

A drawing of the Niue Hotel, the site of ZK2AQ. Note the expedition beam at the far left.

Tired of paper work? Do you get sand kicked in your face along the sea of competition? Weary of Contest weekends where you don't even come close. Cheer up, there is a way to change all of that.

HOW TO MAKE A CONTEST MORE FUN

BY MARTIN LAINE*, OH2BH

This story starts back in 1974 while I was flying back from Gambia where I operated as ZD3X in the CQ WW DX Contest. Immediately after the contest I was feeling great—I had just broken the world record with about 5000 QSO's, all made within 48 hours. The excitement had made the 48 hours pass so quickly that I barely remembered the hardship of logging those hundreds and thousands of contacts by hand. It's a universal feeling after a contest effort, we all feel like that. However, this is only the smaller half of the contest—the bigger half—all that paper work—was stuffed into my briefcase waiting to be sorted out when I got home. My original log was certainly not in good enough shape to send in to Fred Capossela. The problem of how to get rid of all those duplicates that the committee looked for loomed largely in my mind. What about QSLs? Since I was a new country for many amateurs how do I go about sending out all those cards? Does this sound familiar too?

While the large Boeing jet headed on to Finland over the empty Sahara I talked my problem over with my traveling companion Olle OH2LP/ZD3V. Olle had spent his vacation time in Gambia at the same time and now could see first hand how much paper-work the contest could generate. He thought the whole thing over while enjoying a drink and came up with an answer. "Give me your heap of papers and one of the people in my office can clear it all up within six hours. You can have your logs, QSL cards and whatever other information you want." Olle happens to be a computer expert for one of the leading banks in Finland plus the man who gave the course I attended to get my Novice ticket. It's always a good idea to follow your teacher's advice.

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Why do you need a Computer?

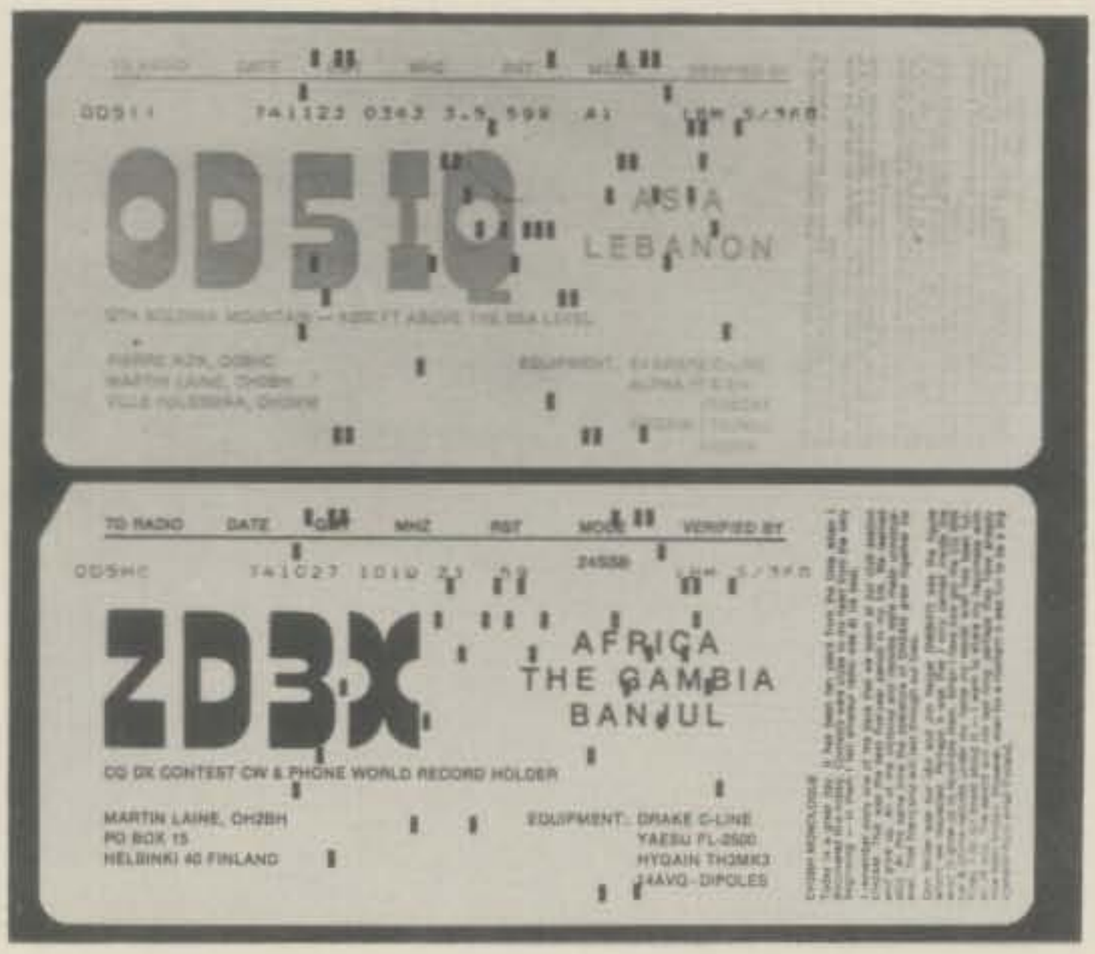
I believe that most contest participants retype their original log. Often it's impossible for another person to interpret the original log for many reasons. Though the contest organizers accept original logs, it's nice to have a clear, understandable log even if it's for your own use. If you want to delete all duplicates from a log with hundreds and thousands of contacts you have only one possible approach. You have to list all prefix groups one by one on all the different bands. Doing this can take several days and it's far from fun. The same tedium is faced when you start to separate all DX contacts from those within your own continent, then to find all of the countries and zones worked on different bands and then add all of these things together. Though it's pretty easy to count all of your contacts, you have to be very careful doing it, for you are computing your result which can and will be checked many times after you submit it. Another

The picture shows OH2BH operating his advance technology contest station.

Olle Helsten, OH2LP is watching that the printing process works out at the IBM 370/145.

point to consider is having a nice looking QSL already printed and in alphabetical order ready for mailing, it's really very tempting.

Personally I feel that my last point is the key to the benefit of computer use. Simply it is the ability to do detailed statistical analysis before, during, and after a contest. This in itself can be a tremendous aid and result in unbelievable accomplishments. You should know, at any point during the contest, what are the factors that can lead to the best final score. Should you spend more time going for multipliers or forget them and quickly move on to get QSO points? What is the relationship between multipliers and QSO points? Is it any good to spend time picking up QSO points within your own continent or spend that time trying to work DX even when there isn't that much activity. How many JA's can you average per hour as opposed to W's? How are band opening conditions to various areas on different bands? If I can keep my present QSO rate I'll meet the previous record and I can probably



Example of the IBM-style QSL-cards that were used for ZD3X and OD5IQ world record contest DXpeditions.

spend some extra time picking up multipliers here and there to play it very safe . . .

These considerations are my golden rules in operating a contest and areas that can be readily served by a computer. At any time during the contest you can get any bit of data on the contest you want. I can assure you that during a contest if you don't know what you are doing and that the "grass isn't any greener" on another band you will probably jump around from band to band and waste a lot of time and energy. With a little analysis you can comfortably put all of your energy and time into productive operating. These basic statistics were my key when I collected the c.w. and s.s.b. world records in the CQ WW DX Contest with very simple station equipment.

What Equipment Is Needed And How Do You Use It?

Based on the mail I've received a large number of amateurs seem to be in the computer and data processing fields. The flow chart illustration shows my set-up at least to an EDP professional, but I would like to add some general comments.

The data collecting terminal we used for the contest log was a programable one, Olivetti type DE-520 (key-to-tape, in the US this is a Sycor DE-520). Since all constant information is programed it only requires the insertion of three variables:

Time in minutes
Call sign
Received zone number

It then becomes very easy to key in the data. The hours part of the time and the reports change at a slower rate and can be corrected when necessary. An individual who is used to keying in data 8 hours a day can easily enter 5000 QSO's within that 8 hours if the terminal program is well made. Your only task is then to compare the data fed into the terminal with the original log.

We then used an IBM 370/145 to sort the calls and compare them for duplicate run-out. In addition, QSO points and multipliers were sorted at this point against the basic information entered into the computer earlier. We now had a check-log at hand and we could see if the process worked out as planned. If there was nothing to correct (a highly improbable occasion) we could run the final log in several copies ready to be submitted. Now, the calls are sorted into alphabetical order without duplicates. They are then punched on pre-printed IBM style cards. The punched information is interpreted in clear text on the cards and you now have QSL cards. All of the data is still available for additional statistics on magnetic tape.

It is true that you would practically need nearly a computer center for this operation. If you had to buy the basic computer time needed you still would be broke fairly soon. Therefore I simply present my

system for those who expressed interest and for those who have access to a computer free of charge themselves or through their friends. For all the others—we can call them the "manual" people—this is just a good example that sooner or later they will be competing against the "machine guns" (not the big guns) and that their chances will be small.

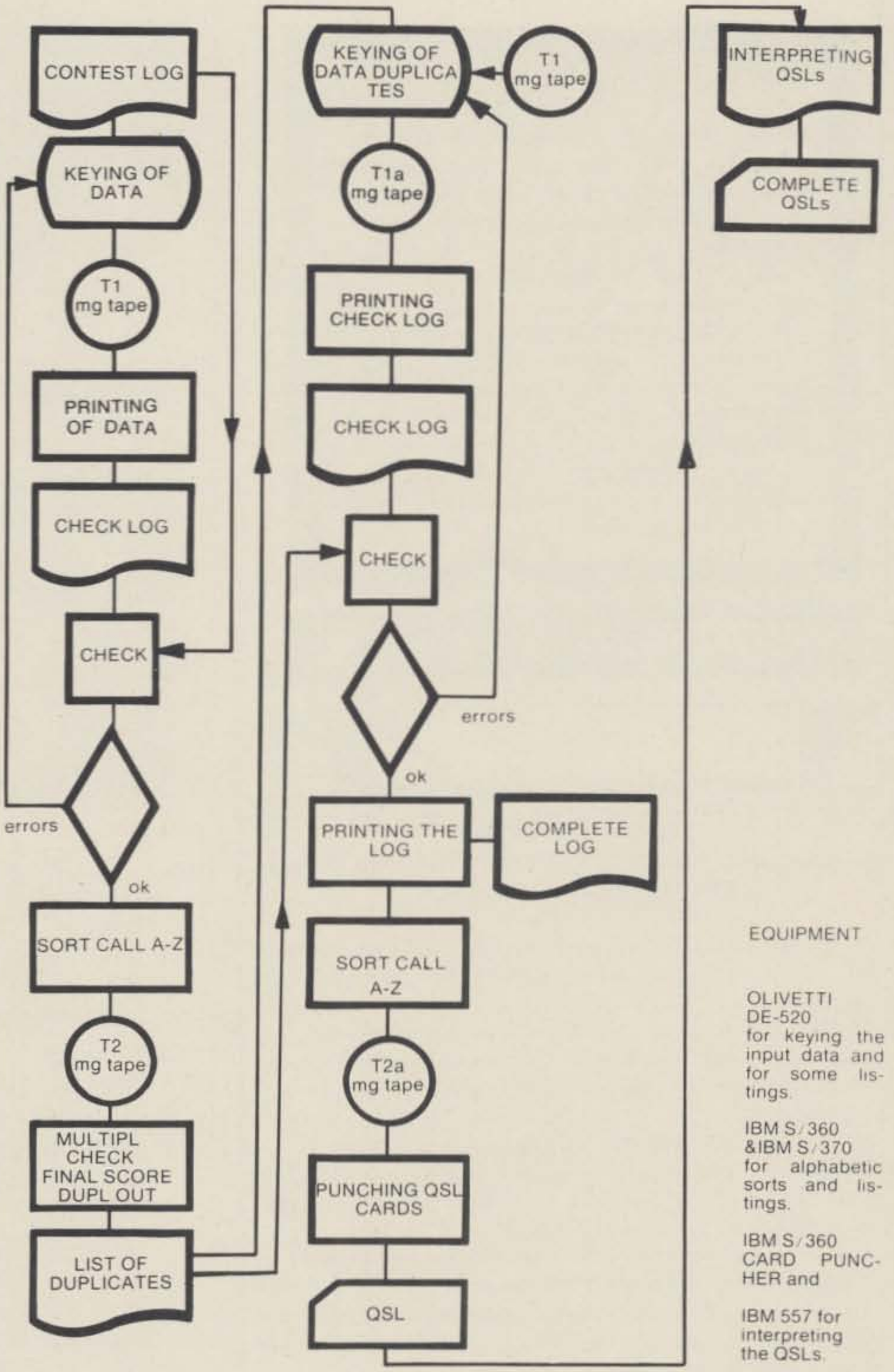
Let's gaze into the crystal ball

You haven't heard me for a long time in the contests. Well I sure worked hard getting something lined up for the next season. I think it's only fair to tell you so you can be prepared against my machines.

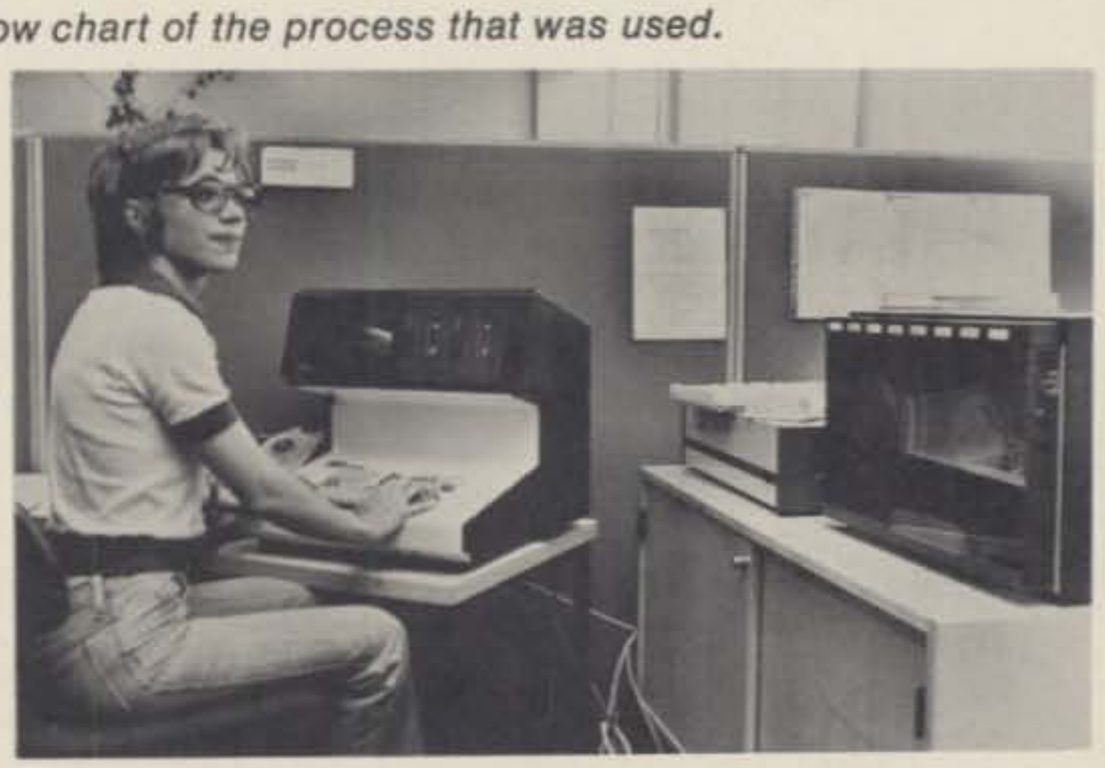
Most of you are familiar with the pre-programed electronic keyers that some of you are already using to help with the manual work when standard message sending is needed. My idea then is to connect all of these things together; to use an on-line computer to compute statistics and do the logging together with the pre-programed message memory function. How about that? Do I need a complete computer center installed in my shack? No.

First, I really don't need any large computer. I can easily use one of the microcomputers available today (such as the Intel MDS) which doesn't cost an arm and a leg. Imagine OH2BH sitting in the middle of the equipment just typing in station calls and received messages plus sending pre-programed messages by pushing one key at a time. The video display shows continuously updated statistics while the main computer realizes a duplicate contact on-line as I try to make it. The computer gives me complete data on my present score and the situation on different bands. At the same time it is blinking hard that VK6RU Zone 29 is missing on 21 MHz.

Let's take a simple example with the following messages that are pre-programed:



Flow chart of the process that was used.

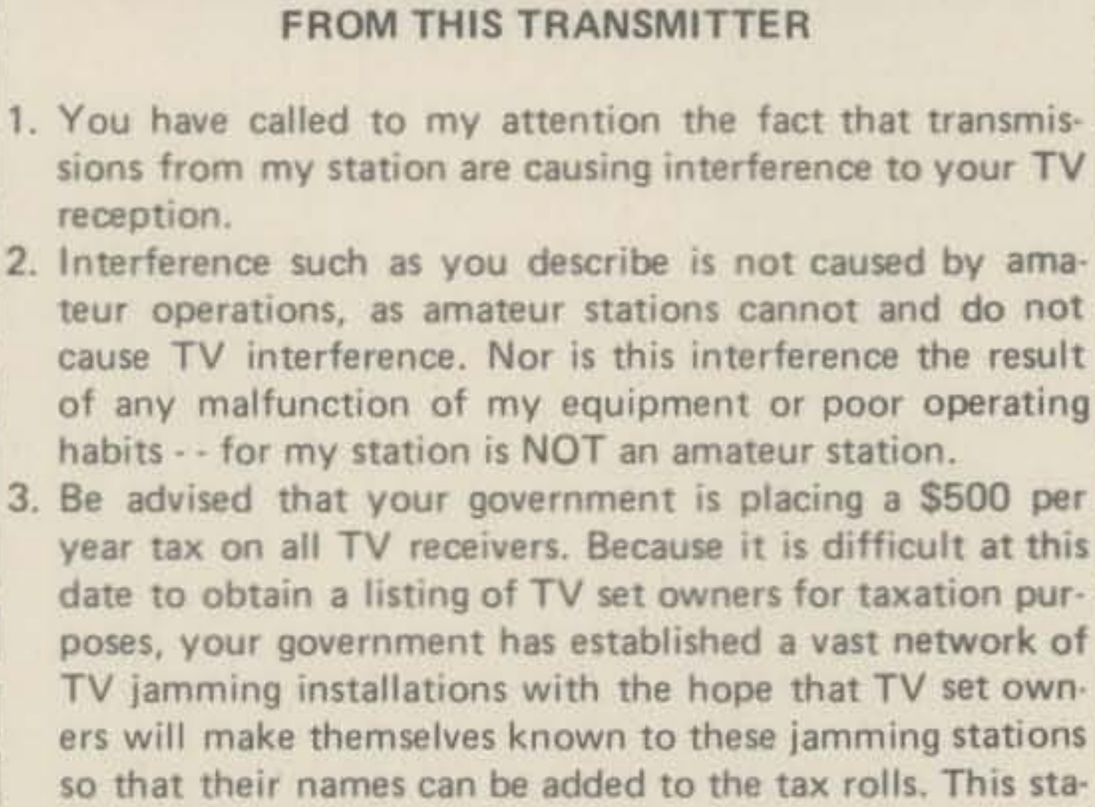


The only hand work is to key in the QSO-information at the DE-520 terminal.

GETTING RID OF TVI (COMPLAINTS)

Got those pesky neighbors pounding on your front door again? Have you put so many filters on your rig that it's a miracle anything is getting through on any frequency?

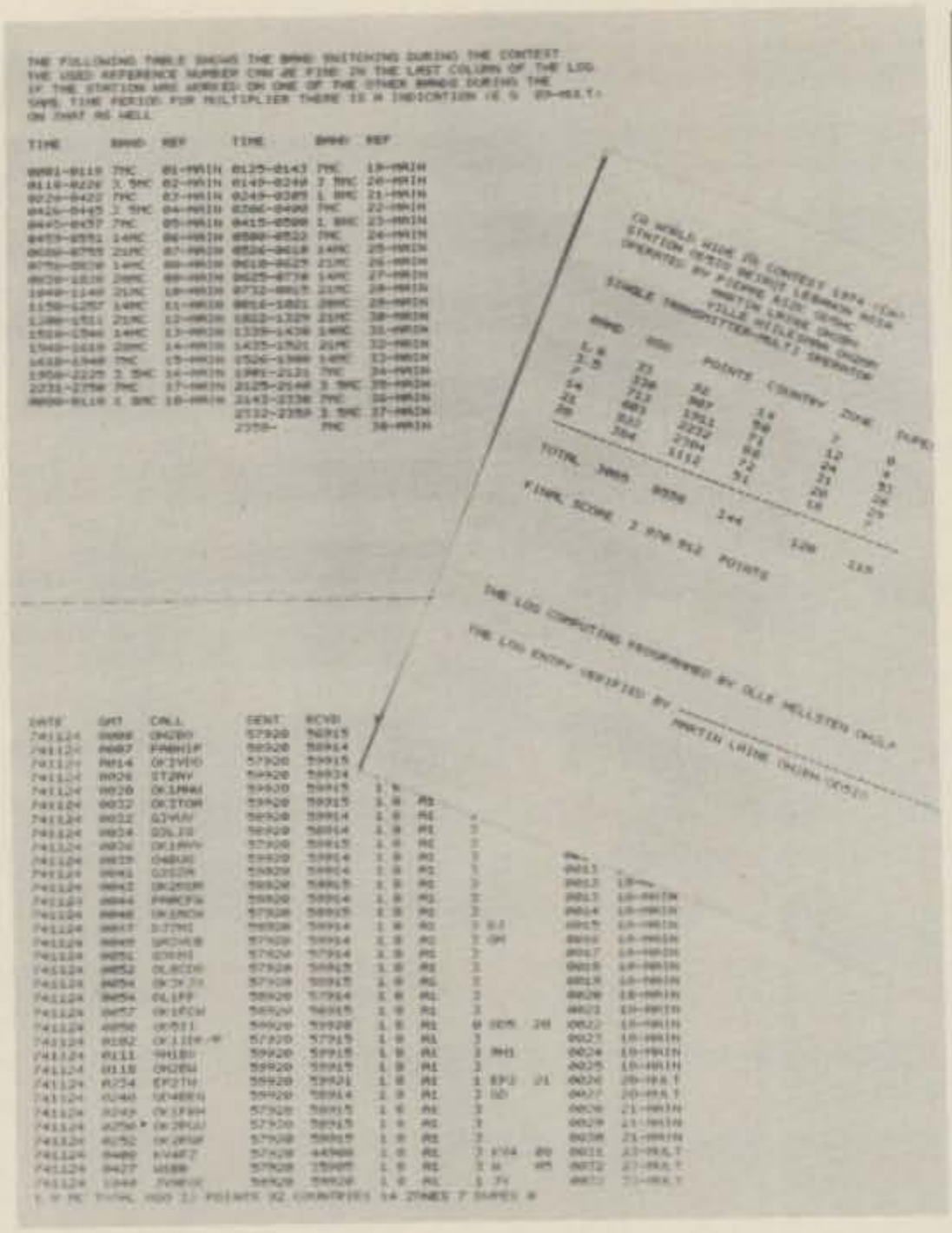
Don't give up! When all else fails, here's the ultimate neighbor silencer! Cut this page out of CQ and hang it up near your operating position, or (if the guy is already stalking up the driveway for the 8th time this week), stick it to your front door with some chewing gum. You might even wish to print up copies and distribute them to all of your neighbors as a preventive measure. Let us know how it works for you.



TO MY NEIGHBORS:
NOTICE CONCERNING ALLEGED TV INTERFERENCE FROM THIS TRANSMITTER

1. You have called to my attention the fact that transmissions from my station are causing interference to your TV reception.
2. Interference such as you describe is not caused by amateur operations, as amateur stations cannot and do not cause TV interference. Nor is this interference the result of any malfunction of my equipment or poor operating habits - - for my station is NOT an amateur station.
3. Be advised that your government is placing a $500 per year tax on all TV receivers. Because it is difficult at this date to obtain a listing of TV set owners for taxation purposes, your government has established a vast network of TV jamming installations with the hope that TV set owners will make themselves known to these jamming stations so that their names can be added to the tax rolls. This station is such an installation.
4. Your government greatly appreciates your turning yourself in. You will be one of the first taxed. You have also verified that this TV jamming equipment is functioning properly.
5. We have also made note of the time and channel which you reported this jamming. This information will be given to several TV program rating surveys.
6. You have therefore provided a valuable service to the entertainment industry and to your government.
7. So that you will not be the only one taxed, please be patient as we continue our TV jamming operations.

_____
OPERATOR
OFFICE OF TV TAXATION



Example of the final log that was supplied to the CQ contest Committee.

1. W---- 59935 K
2. W---- 59935 59935 W---- K
3. W---- 59935 59935 W---- DE ZD3X K
4. CFM SK
5. CFM DE ZD3X
6. W---- CFM DE ZD3X
7. CFM DE ZD3X TEST K
8. W---- PSE AGAIN K
9. AGN K
10. SRI DUPE QSO DE ZD3X TEST K

So, when a station is calling you just type in his call and an applicable command like W2PV 14Z and hit the start key when you want to transmit the response. That instruction means that W2PV is considered to be a good brave fast moving guy who will realize the quickest possible message at once. Number 1 stands for quick report, number 4 for quick confirmation without own call and Z stands for highest speed. When you hear W2PV giving you 59905 you just type in 05 and start command for message number 4. That means that 05 goes only to the computer and confirms that complete QSO data can now be entered. The message number 4 confirms the same thing to Dr. Jim Lawson, W2PV. The QSO went into the computer on-line and the possible changes in the statistics can be immediately seen on the display.

(Continued on page 75)

GOOD-BYE TO THE WWV PROPAGATION FORECASTS— Unless we do something ...NOW!!!

BY THEODORE J. COHEN*, W4UMF and GEORGE JACOBS, W3ASK

You remember the radio propagation forecasts broadcast by National Bureau of Standards' radio station WWV at 14 minutes after each hour, don't you? They're the ones that sound as follows:

THE RADIO PROPAGATION QUALITY FORECAST FOR *0700* UTC IS *FAIR*. CURRENT GEOMAGNETIC ACTIVITY IS *QUIET*. THE CODED FORECAST IS *NOVEMBER FIVE* — REPEAT, *NOVEMBER FIVE*. THE K-INDEX AT *0600* UTC IS *TWO* — REPEAT, *TWO*-TENDING TO *INCREASE*. THE 2800 MEGHERTZ SOLAR FLUX INDEX IS *EIGHTY-SEVEN*—REPEAT, *EIGHTY-SEVEN* — TENDING TO *REMAIN CONSTANT*.

Well, take a good listen, because the U.S. Department of Commerce now intends to discontinue providing these data to WWV, and the broadcasts will cease effective October 1, 1976. More specifically, the Department of Commerce's Institute for Telecommunication Sciences intends to close the Telecommunication Services Center at Boulder, Colorado on October 1, for budgetary reasons. In addition to the WWV broadcasts, closing of the Telecommunication Services center will result in the loss of the *Weekly Radio Telecommunications Forecast* and of the forecasts which the Center has made available previously by telephone.

In short, it will leave radio amateurs and all other users of the h.f. spectrum without real-time ionospheric, solar and geomagnetic data which are currently used to prepare short-term forecasts and longer forecasts for up to 27 days in advance

The letter and number-type forecasts broadcast by WWV were initiated shortly after World War II, and were given only in c.w. for many years. As their importance to users of the h.f. spectrum increased, they were changed to voice transmissions a few years ago. These broadcasts are famous throughout the world, and are tuned-in on land, in the air and on the high seas. This is an area of applied radio propagation where the United States took, and has held the lead.

Forecasts in the form shown above, however . . . that is, forecasts containing solar and geomagnetic data . . . were not initiated until 1974. They began shortly after an article appeared in *CQ*[1] demonstrating the usefulness of these two parameters in determining real-time conditions in the h.f. spectrum, and after hundreds of radio amateurs wrote to the Department of Commerce requesting that such data be included in the hourly propagation broadcasts on WWV.

In March, 1975 an article appeared in *CQ*[2] which, for the first time, described a method whereby radio amateurs and other h.f. users could make their own day-to-day propagation forecasts. The method, applauded as a breakthrough in simplifying propagation forecasts, in a relatively simple do-it-yourself way for forecasting day-to-day conditions for up to 27 days in advance, with a relatively high degree of accuracy. It depends, however on the near real-time values of solar flux and geomagnetic activity broadcast hourly on WWV.

In addition to forecasting general conditions, the article also described how near real-time values of solar flux and geomagnetic activity, when applied to propagation predictions of the type that appear monthly in *CQ's Propagation* column, can be used

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[1] "Short-Term Predictions for Ionospheric Propagation", Cohen, T.J., *CQ*, Sept. 1974, p. 27.

[2] "A Breakthrough In Simplifying Ionospheric Propagation Forecasts", Jacobs, G. and Cohen, T.J., *CQ*, March, 1975, p. 16.

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for determining day-to-day conditions and variations on specific paths to any area of the world.

If the WWV hourly propagation broadcasts are terminated October 1, users of the h.f. radio spectrum will be *deprived of their only source* of near real time ionospheric, solar and geomagnetic data required for do-it-yourself forecasting. In a sense, it will be a return to the "dark ages" for h.f. propagation forecasts.

Are do-it-yourself forecasts really reliable enough to worry about the loss of the WWV broadcasts? Do combinations of solar flux and geomagnetic activity really describe day-to-day conditions, and how accurate are forecasts made up to 27 days in advance? All available data points to a resounding YES, in reply to these questions. Here's some more proof.

Using the values of solar flux and geomagnetic activity broadcast on WWV for the past two years as a basis, and the categories of conditions shown in figure 1,[2] conditions have been found to recur in *exactly* the same category 27 days later for *63% of* the time. This means that by using the *CQ* do-it-yourself method for forecasting, you can expect to be right on the nose 63% of the time for forecasts made up to 27 days in advance. This is a pretty good result when one considers that a random process would result in only 20% accuracy.

If the forecast was within one category of the observed condition (i.e. HIGH NORMAL forecast, LOW NORMAL observed), and if differences between LOW and BELOW NORMAL are considered a miss, then the accuracy of the forecasting method rises to 82%! Further, at the present time accuracy may even be higher, due to the relatively quiet conditions on the Sun.

Just when radio amateurs and other users of the h.f. spectrum are making effective use of solar and geomagnetic data in preparing short-term and long-term forecasts on a day-to-day basis, we are about to be deprived of the only source available for this data on a near real-time basis . . . the WWV hourly propagation broadcasts!

What can be done about this? You can request, in fact urge, that the U.S. Department of Commerce reconsider their decision to close the Telecommunication Services Center in Boulder. But it will take a large outpouring of letters to convince the Department of the need for the Center and the WWV hourly propagation broadcasts. Send a letter or postcard to the Department of Commerce, expressing your concern for the loss of the broadcasts and services provided by the Center. Be sure to explain how you have been making use of the broadcasts as a radio amateur. Write:

Dr. Douglas Crombie
Director
U.S. Dept. of Commerce
Boulder, Colorado 83032

But write TODAY; tomorrow may be too late! That October 1 shut-off date is fast approaching after which it will be GOOD-BYE to the WWV propagation forecasts, and a dangerous step backwards for Amateur Radio. ■

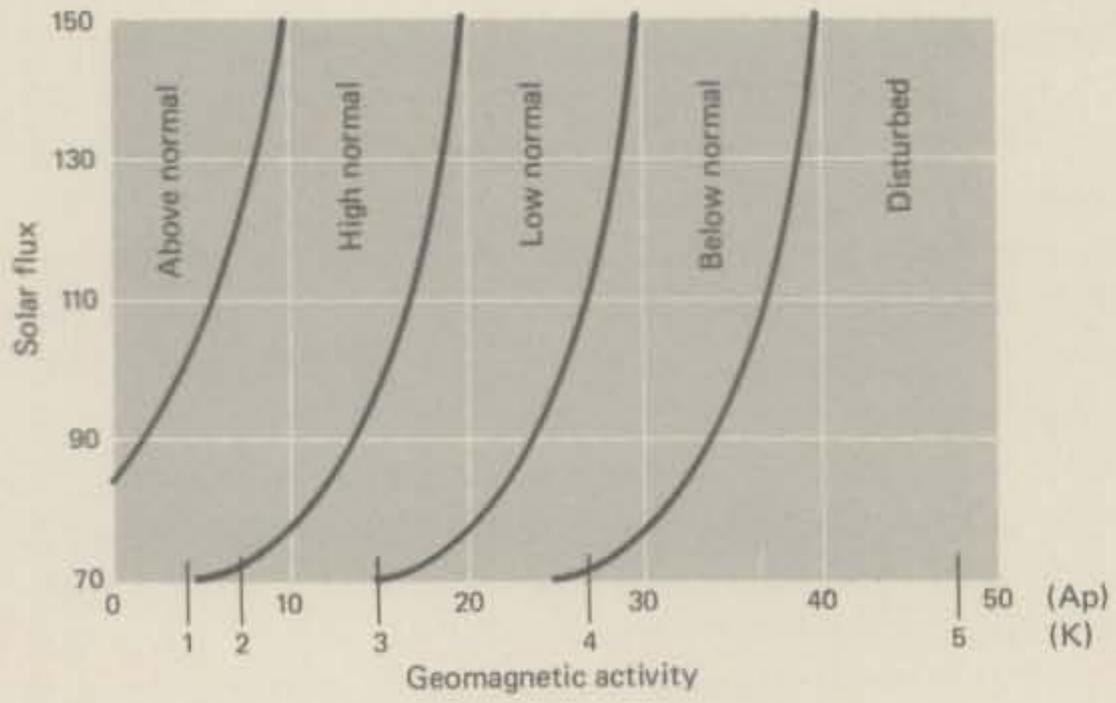


Fig. 1—Intersection of given values of solar flux and geomagnetic activity determine expected h.f. ionospheric propagation conditions. (Example: S.F. = 80 Ap = 25; expect Below Normal conditions.) From mid-1974 to mid-1976, conditions recurred 27 days later exactly as defined in the above categories 63% of the time, and within a range of one category 82% of the time (counting differences between LOW and BELOW NORMAL as a miss.)

Here's a one or two evening project that will add a versatile piece of test equipment and transmitting aid to your shack.

An Improved Antenna Noise Bridge

BY JOHN J. SCHULTZ*, K3EZ

Antenna noise bridges are not new but is it only in recent years that the components necessary to economically home-brew them have been available. These bridges can be very useful both as a tool for antenna experimentation and as an operating accessory. For experimentation, they can be used to measure the impedance at antenna terminals or at the end of transmission lines. The antenna itself or matching or loading devices on the antenna can be adjusted then for the desired impedance at a specific frequency. The basic setup and operation is shown in fig. 1.

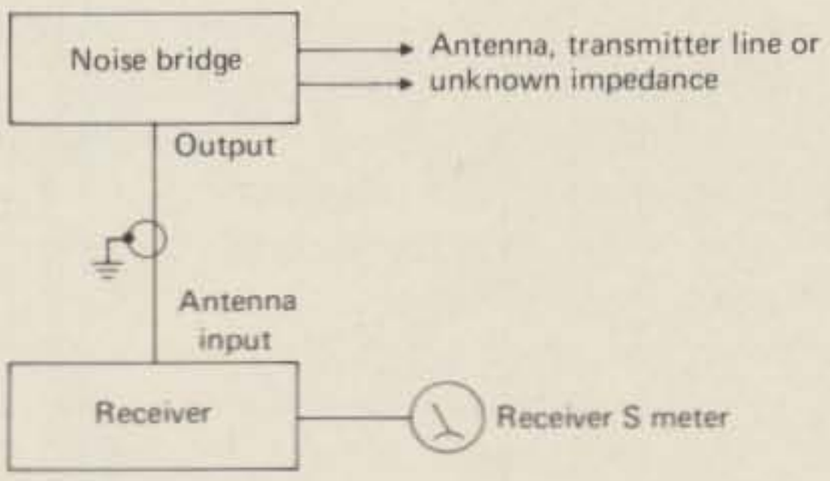


Fig. 1—To measure an unknown impedance, the receiver is set to the frequency of interest. The dials on the noise bridge are adjusted for a null in the S meter reading. Impedance values can then be read directly from the dials on the bridge.

The noise bridge operates in conjunction with a communications receiver. If a portable receiver such as the Heath GR-78 or Barlow-Wadley XCR-30 is available which has good calibration on the h.f. bands, a completely portable measuring setup is available. Measurements are simple to make and the method has far more convenience and accuracy to it than using a grid-dip meter or a s.w.r. meter for similar purposes.

As an operating aid, one can perform completely "silent" tuning of a transmitter. For instance, if a transmatch is being used to match an antenna system, the noise bridge is set at 50 ohms and the transmatch elements adjusted for a matched condition as illustrated in fig. 2. The transmitter itself can be tuned up into a dummy load. Once the tuning has been accomplished, the transmitter output is connected to the transmatch and one is tuned up and ready to go on the air. This method of "silent" tuning had some military application years ago but its main value for the amateur is that transmatch (or other tuning network adjustments) can be done in complete leisure and without radiating a lot of interference since the only signal radiated is a very low level broadband noise signal. Also, one doesn't have to worry about the transmitter output stages being abused while one experiments with different

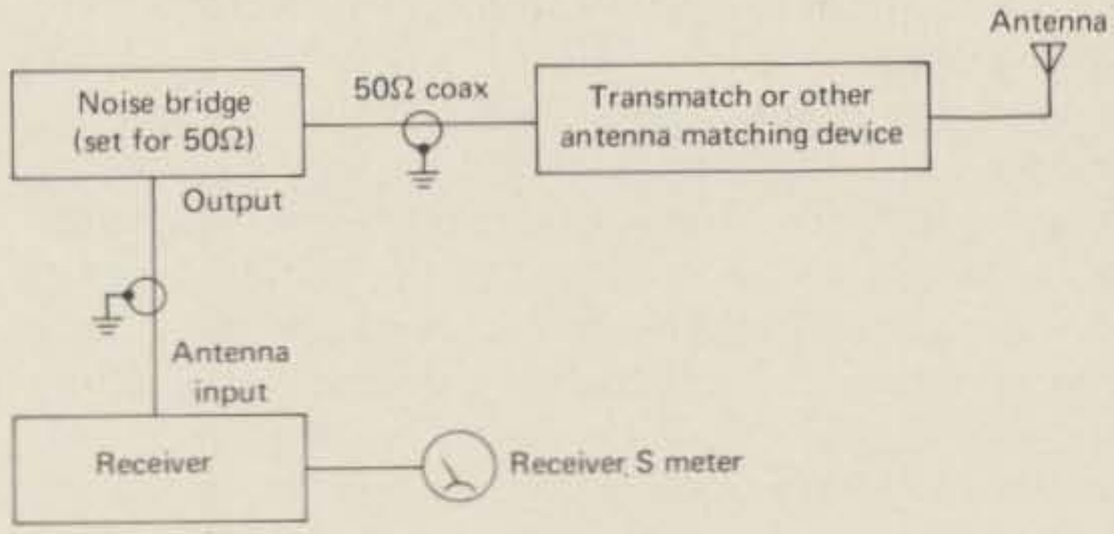


Fig. 2—To adjust an antenna tuner without putting a transmitter on the air, set the noise bridge for 50 ohms and the receiver to the operating frequency. The antenna tuner controls are then adjusted at leisure for the best null in the S meter reading.

*c/o American Consulate General, Box L, FPO N.Y. 09544

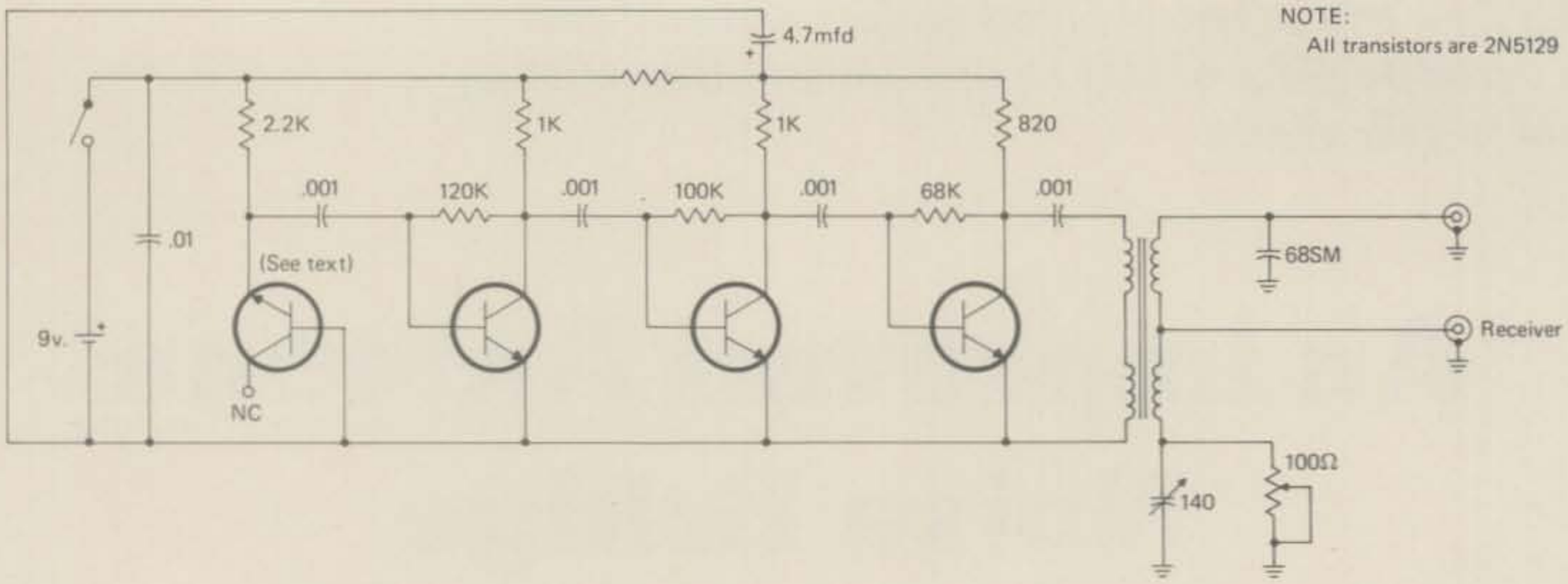


Fig. 3—Complete diagram of the noise bridge. The 100 ohm pot is a carbon, linear taper type. The transformer construction is described in the text. The toroid core needed (Indiana General CF 102, ⅜") is available for a dollar plus shipping from Whitehouse Co., Newbury Drive, Amherst, N.H. 03031.

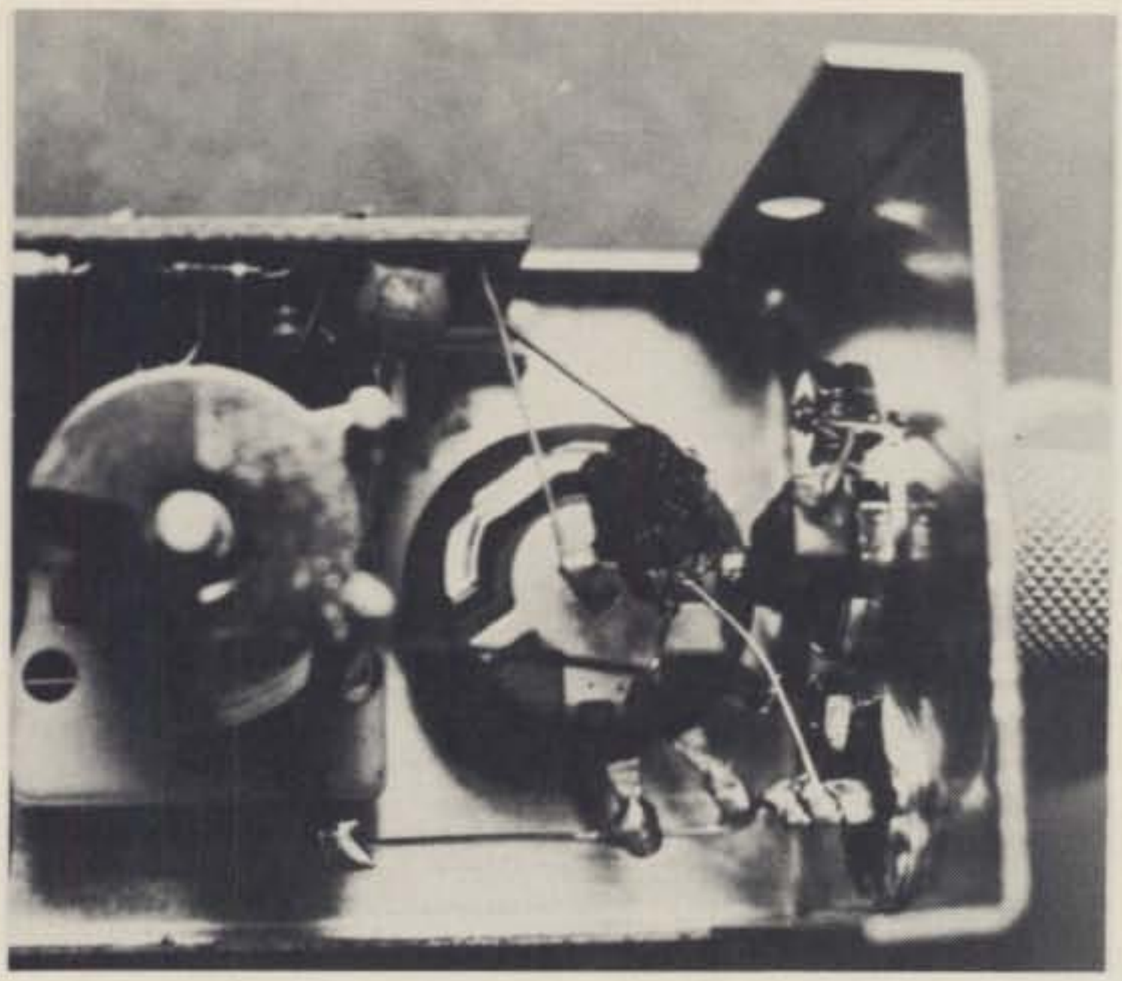
matching network settings.

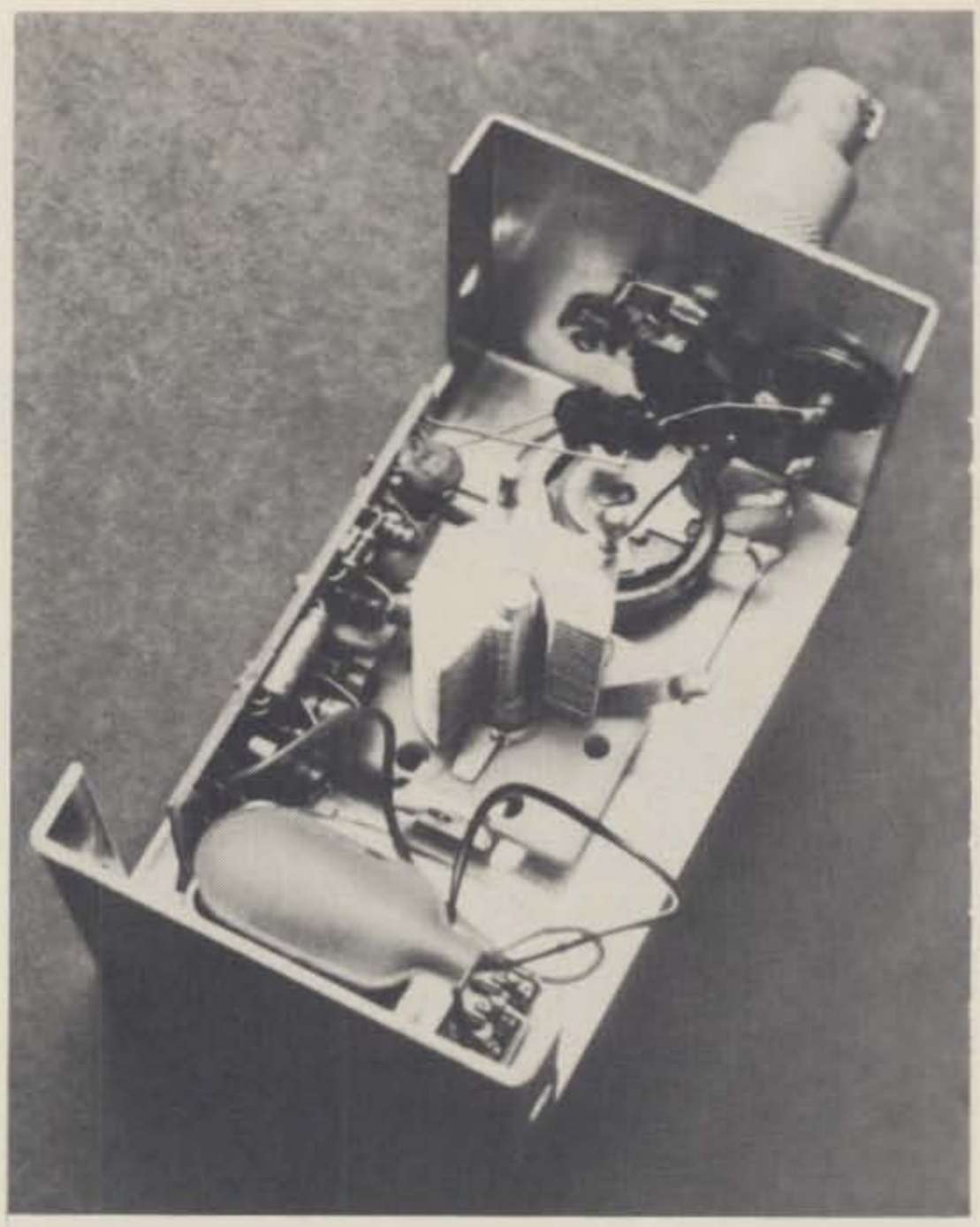
This article presents some simple constructional techniques for building a noise bridge and also describes some improvements in performance and battery life made possible by the use of currently available semiconductor devices.

The noise bridge consists of a broadband noise generator, noise amplifier and a toroid transformer/bridge. The latter is pretty well the heart of the instrument but it is not difficult to construct. The diagram of a typical noise bridge is shown in fig. 3. A diode acts as a broad-band noise generator, three transistor stages provide noise amplification and the toroid transformer couples the broadband noise signal to the secondary which is wired in the form of a bridge. Like any bridge when the elements around the bridge are balanced, the output is zero. In this case, the output of the bridge goes to the receiver antenna terminals and the antenna (or line) to be measured is compared to the R and C values in the bridge. These R and C values in the bridge can be chosen in accordance with the values of unknown impedances likely to be encountered. That is, with a 100 ohm potentiometer and 140 pf values, as shown, resistive impedance values from about 0 to 100 ohms can be measured and reactive values of impedance (inductive or capacitive) from about 0 to 70 ohms. To understand the latter range, note that there is a fixed 68 pf capacitor across the "unknown" terminals. So, if the "unknown" has no reactive element to its imepdance, the variable capacitor has to be set at its mid-point to balance the bridge. Other R and C values can be chosen to expand the range of the bridge but then readout accuracy is lost unless one goes to reduction drives on the R and C shafts. In reality, one usually is not dealing with totally unknown and wide ranging impedances but simply wants to adjust an antenna or matching device that is already approximately set. Experience has shown that the values shown are usable for most applications. One can—to further simplify the bridge—eliminate the fixed and variable capacitors. Then, the bridge will measure correctly only unknowns having a purely resistive impedance. This is no disadvantage in many cases, particularly if the bridge is used only to tune a transmatch up. In fact, for this case, the 100 ohm potentiometer could just as well be replaced by a fixed 51 ohm carbon composition resistor.

The bridge should be constructed in a metal enclosure and a good quality connector (SO-239 or BNC type) used for the "unknown" terminal. The output to the receiver can be a simple phono jack. The whole unit can be constructed on a small piece of perforated board stock and powered by a standard 9V transistor radio battery. Note, however, that the negative supply line is left floating and not connected to the metal enclosure. The current drain is only 8-10 ma.

Some attention must be paid in the construction process to a few points if good results are to be obtained. The first point is in the selection of a diode as a noise generator. Usually a selected 6.8 volt zener is used as the noise diode. But, it was found that the emitter-base junction of a 2N5129 performed as well or better. Also, since this is the same transistor used for the amplifier stages, the number of parts to be purchased is reduced. Nonetheless, the emitter-base junction of individual 2N5129's will vary in their quality as noise generators and if one wants to use the bridge up to its full capability (into the v.h.f. range) a selected 2N5129 must be used as the noise source. This is no great problem or expense since 2N5129's or types which should work as well (2N5137 or 2N5220) have been selling as low as 10 for $1.00 at surplus





The photos shows construction of a noise bridge in a 4 × 2¼ × 2¼ snap-box enclosure. The toroid transformer is supported by wire leads from the board containing the noise amplifier and from the antenna and receiver jacks. Below the toroid is a 100 ohm potentiometer from which the metal back cover has been removed.

houses in the plastic case version. Build the noise amplifier but leave provision for plugging in or test soldering in different 2N5129's as both the noise diode and as amplifiers. Listen to the noise output of the amplifier on a receiver tuned to the highest band of interest (usually 10 or 2 meters). Try different 2N5129's both as noise diodes and as amplifiers until the highest noise output level is produced. A level of 10 to 20 db over S9 should be obtained.

The second element that deserves care is the construction of the toroid transformer. There is only one winding on the toroid consisting of 4 to 4½ turns of four #28 enameled wires twisted together. This type of "quadrifilar" winding is used to ensure good balance between the primary/secondary and center-tap on the secondary side. It sounds rather imposing but is easy enough to construct.

Take a small piece of perforated board stock and pass four enameled wires (about 5" long) through 4 adjacent holes in the board. Hold the wires together and slowly twist the *board* as the wires are slowly pulled through the board. With only one-time practice one should be able to produce a very professional looking product. Once wound on the core use an ohmmeter to find the winding ends and connect the *end* of one winding to the *beginning* of a new winding to form the primary side of the transformer. Ditto to form the secondary winding.

The first point in construction is to keep lead lengths and stray capacitances at a minimum. Particularly keep the secondary leads of the toroid going to the "unknown" terminal and to the 100 ohm potentiometer short. The center-tap lead going to the receiver terminal can be extended using RG174 coax if this results in a better construction layout. For instance, having the "unknown" terminal at one end of an enclosure and the receiver terminal at the other end. In the unit shown in the photograph both terminals were located at the same end of the enclosure. The metal back cover from the 100 ohm potentiometer should be removed and if there is any choice available a potentiometer used which has a minimum of metal parts.

The bridge is capable of surprisingly good results if carefully constructed and used. One should first use a 51 or 47 ohm resistor placed inside a coaxial connector for shielding and use it as a dummy load to test the bridge. When connected as in fig. 1, the S meter on the receiver will show a definite, sharp null as the 100 ohm potentiometer is adjusted and as the 140 pf capacitor is adjusted. The null, in fact, should bring the S meter reading from S9 plus to less than S1. The potentiometer has to be turned slowly, particularly with some transceivers to give the a.g.c. circuit time to react to the rapid signal level change as the null is approached. The capacitor should be in its mid-range position. The potentiometer setting should be marked for 50 ohms. The potentiometer can be further calibrated by using 10 and 100 ohm resistors.

(Continued on page 75)

In Focus

BY BILL DEWITT, W2DD

Resolution Revisited— Background

A fundamental need of any TV system is the ability to reasonably reproduce the details of the original subject. The term used to describe the ability to reproduce fine detail is **Resolution.**

You may recall that "In Focus" columns for last August and October discussed the need for an SSTV resolution chart. The October column pictured an experimental chart (see fig. 1) made up by yours truly.

Because of this expressed interest in the problems of SSTV resolution and how to measure it, Dr. George R. Steber, WB9LVI, wrote to me recently to describe some experiments he has carried out in relation to one phase of this subject. With Dr. Steber's permission, his letter is presented here along with photographs that should be of great interest to all slow scanners.

Resolution Revisited— Dr. Steber's Experiments

To W2DD—Enclosed are the photographs relating to the horizontal resolution tests I made on a slow scan television signal. Briefly, this is what was done and why.

As you know, there is a minor controversy on the SSTV channels over the amount of horizontal resolution (ability to display fine detail) that is actually transmitted by a conventional slow scan signal and effectively displayed by a digital slow-to-fast scan converter. It is felt by some that horizontal resolution in excess of 128 lines is actually transmitted and received with standard slow scan. If this is true, then more than 128 picture samples **(pixels)** per horizontal line would be required to display the full capability of the transmitted picture.

Since a research grade minicomputer image processing facility is available to WB9LVI, it was decided to run some tests to attempt to partially answer the above question.

It was decided to process several slow scan pictures using a different number of pixels per line to see if any difference could be detected in the final pictures as the spatial sampling frequency was increased. To provide variety, a picture of a face and a resolution chart designed by W2DD were used as subjects. In order to be fairly realistic, a standard slow scan signal was generated using hardware representative of that currently being employed by slow scanners.

A conventional closed circuit camera was connected to a W6MXV fast-to-slow scan converter to produce a standard slow scan signal. This signal was then low pass filtered to remove extraneous high frequency components and delivered to the minicomputer image processing system for analysis and display.

The results of the tests are shown in the photographs. Figures 2 and 3 both utilize 128 pixels per horizontal line while figures 4 and 5 utilize 256 pixels per line. The number of vertical lines in each case is the same—128.

It is clear from the resolution chart photographs that there is resolution capability in slow scan signals that requires more than 128 pixels per line to display. (The horizontal jitter in the picture of fig. 5 is caused by a slight instability in the W6MXV clock circuit.) Tests using commercial sampling cameras such as the Robot also confirm this result. Tests also indicate that the resolution of the

*2112 Turk Hill Road, Fairport, N.Y. 11450

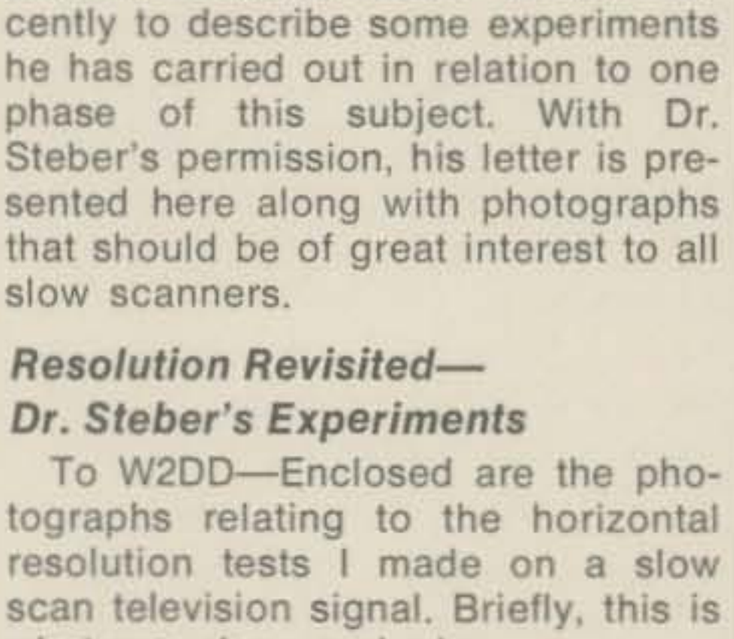


Fig. 1—Original experimental SSTV Resolution Chart designed by W2DD.

Fig. 2—Girl's head SSTV picture displayed on fast scan monitor via digital scan conversion. 128 lines and 128 pixels per line. Photo by WB9LVI.

Fig. 3—Girl's head SSTV picture displayed on fast scan monitor via digital scan conversion. 128 lines and 256 pixels per line. Photo by WB9LVI.

slow scan signal appears to be greater than 128 lines. The exact number of lines transmitted is not exactly known, but is estimated to be around 135. This of course means that an SSTV picture does not have equal horizontal and vertical resolution.

Another point to be made is that if one applies the Kell[1] factor in the horizontal direction to the pixels along a line, it is found that 128 pixels per line results in an effective resolution of only 90 lines. Similarly, an effective resolution of 128 lines would require 170 pixels per line; and a resolution of 135 lines would require 190 pixels per line.

In fairness, it should also be mentioned that viewing pictures is very subjective. For example, the loss of resolution in viewing fig. 2 of the girl compared to fig. 3 is not very noticeable. *(Note from W2DD — this means viewing the picture as a whole.)* However, if one looks closely, it can be seen that a large amount of detail is missing from certain areas in fig. 2 e.g. the headlamp region. (Lower left in fig. 2) Never-the-less this might be perfectly acceptable if the slow scanner is willing to accept a slight resolution loss in order to gain the convenience of operating with standard fast scan television components for input and display as employed with digital scan converters. *(Or storage tube scan converters—W2DD.)*

That about wraps it up Bill. I hope this will be of some use.

Best regards,
(Signed) George

Our thanks to Dr. Steber for sharing this important information with "In Focus" readers. It has great significance so far as future design considerations are concerned.

Resolution Revisited—Practicality and "Trade-Offs"

Please note that Dr. Steber's data refers to SSTV pictures displayed by

Fig. 5—Resolution chart displayed as in fig. 3, 128 lines and 256 pixels per line. Photo by WB9LVI.

digital scan conversion on a fast scan monitor. Within the limitations of P-7 monitor viewing, I believe that we can say that the *horizontal* resolution of a P-7 display would be superior to a 128 pixels per line digitally scan converted image. Storage tube scan converted images are also slightly better in *horizontal* resolution than those digitally converted at 128 pixels per line. That brings us to the trade-off mentioned in the second last paragraph of Dr. Steber's letter: "—if the slow scanner is willing to accept a slight resolution loss in order to gain the convenience of operating with standard fast scan television components for input and display with digital scan converters."

Where do you draw the line on options or trade-offs? Admittedly our 128 line system is lacking in fine detail reproductive capability—so we can't afford to lose resolution on a piece by piece basis. Robot Research captured an advantage of the storage tube's enormous memory capability with their 256 line frame in the Model 300. But in a trade-off for cost considerations, their new Model 400 digital scan converter is limited to the 128 line mode.

In all fairness, one must admit that 256 line pictures with their greatly improved resolution and "resistance" to multi-path defects didn't exactly spread like wildfire, but there's still interest there. One can only hope that 256 line pictures will not disappear from the scene.

Resolution Revisited—Perspective

My comments re "Practicality and Trade-Offs" should not be interpreted as critical of the digital route to scan conversion. The advantages of viewing bright, complete, B and W images are obvious. Storage tubes are very expensive and not getting any cheaper! Digital IS the way to go.

The quality of digitally scan converted SSTV pictures has already been well accepted. One can expect to see several thousand digital scan converters in use within the next five years. In the meantime, let's be optimistic and expect that micro-processor applications will bring signal processing techniques powerful enough to yield improved resolution and better picture quality. We'll have more on this subject in an early issue, but YOUR comments are solicited.

Robot's New Digital Scan Converter

Robot's new digital scan converter, the Model 400, has created lots of interest among sstv aficionados. It's a beautifully designed, compact package: Width 12½ in., Depth 11¾ in., Height 6 in. All solid state, it has a

Fig. 6—Girl's head photo from original Cop MacDonald tape supplied to W3LDS at start of present SSTV system. This picture was made from off-the-air reception from W2ELF (who had the tape on loan) by W2DD. See other details in text.

[1]In his "Comments On Television Resolution", Roger Hibbard defined the Kell factor as follows: The Kell factor is experimentally derived and represents the relationship between the total number of active scan lines per frame, and the actual resolving power determined in a visual manner. I believe that Dr. Steber is applying this factor to the horizontal resolution of the SSTV image in this case because the horizontal lines are made up of individual points of information (pixels) which can be compared to the scan lines mentioned in Hibbard's definition.

Fig. 4—Resolution chart displayed as in fig. 2, 128 lines and 128 pixels per line. Photo by WB9LVI.

SUGGESTED CAMERA SETTINGS FOR PICTURES OF TELEVISION IMAGES

Kodak Film	Use for	Black-and-White Television Set		Color Television Set	
		Leaf-Type Shutter	Focal-Plane Shutter	Leaf-Type Shutter	Focal-Plane Shutter
Verichrome Pan Plus-X Pan	Black-and-White Prints	1/30 sec f/4	1/8 sec f/8	1/30 sec f/2.8	1/8 sec f/5.6
Tri-X Pan	Black-and-White Prints	1/30 sec f/5.6 ↓ 8	1/8 sec f/11 ↓ 16	1/30 sec f/4 ↓ 5.6	1/8 sec f/8 ↓ 11
Kodacolor-X* Kodacolor II*	Color Prints	1/8 sec f/2.8 or 1/15 sec f/2	1/8 sec f/2.8	1/4 sec f/2.8 or 1/8 sec f/2	1/4 sec f/2.8 or 1/8 sec f/2
Kodachrome-X* Ektachrome-X*	Color Slides				
High Speed Ektachrome (Daylight)* — with Normal Processing, ASA 160	Color Slides	1/15 sec f/2.8 ↓ 4	1/8 sec f/4 ↓ 5.6	1/8 sec f/2.8 ↓ 4	1/8 sec f/2.8 ↓ 4
High Speed Ektachrome (Daylight)* — with ESP-1 Processing for a Speed of ASA 400†	Color Slides	1/30 sec f/4	1/8 sec f/8	1/30 sec f/2.8	1/8 sec f/5.6

IMPORTANT: **With leaf-type shutters, use a shutter speed of 1/30 second or slower. With focal-plane shutters, use a shutter speed of 1/8 second or slower to avoid dark bands in your pictures. With shutter speeds slower than 1/30 second, use a tripod or other camera support.**

NOTE: **The symbol ↓ indicates the lens opening halfway between the two f-numbers.**

***Pictures of color television taken without a filter will look somewhat blue-green. With the color films in the table, you can use a Kodak Color Compensating Filter, CC40R, over your camera lens to help bring out the reds in your pictures. Increase the exposure suggested in the table by 1 stop.**

†You can expose Kodak High Speed Ektachrome Film (Daylight), 120 or 135 size, at a speed of ASA 400 when you use the Kodak Special Processing Envelope, ESP-1, sold by photo dealers.

complement of 19 transistors, 77 IC's, 16 4K RAM's on one glass epoxy PC board.

The 400 accepts 525/625 standard TV video or SSTV from receivers, tape recorders or keyboards. SSTV output is the standard 1200 to 2300 Hz. with line rates of 15Hz for 60Hz, 16⅔Hz in 50Hz countries. Fast scan outputs (to TV Monitors) are also compatible with 50 and 60Hz mains. Controls are held to a minimum.

The heart of the 400 is a 65,536 binary-bit memory made up of 16 4096-bit Randem Access-Memory chips. The displayed picture consists of an array of 128 by 128 discrete picture elements (pixels). Each element is coded into one of 16 gray shades. You can see the digital quantization effects in the picture, but as pointed out earlier in this column, picture quality is really very good. (We'll have some off-the-screen photos in this column soon.)

Robot's clever design includes an internally generated gray scale which appears at the bottom of each displayed picture. This makes it easy to set up the 400 easily for either receive or transmit.

Priced at $695, the 400 brings high quality scan conversion within the reach of a lot more hams. More details in an early issue.

Fig. 7—A CQ format received from John Sink, WB4JEV, by W2DD.

Fig. 8—John's CQ format after a little reworking by W2DD and his scan converter!

Slow Scan History— A Magnetic Echo Of The Past

There are still a few of slow scan's EARLY, early birds around. One of them is Tony Gallo, W3LDS, of Ford City, Pa. The accompanying photograph of an attractive gal (fig. 6) is from a tape received by Tony from Cop MacDonald the inventor of our slow scan system, in the early days of the system. (Cop sent a tape containing a variety of subjects to Tony to help him get his monitor set up for the then new f.m. sub-carrier system.)

In one of our frequent early morning on the air conversations Tony pointed out that although slow scan hardware has changed greatly since those early days, no improvement in picture quality has taken place except for the somewhat faltering 256 line format mentioned earlier in this column. Sort of an interesting observation from a chap who was there at the start! Incidentally, yours truly is responsible for the photograph of the fast scan displayed image via a Robot 300.

A Photographic Freebee!

With more and more slow scanners viewing received pictures on B and W TV monitors, this seems like a good time to mention that the Eastman Kodak Co. publishes an excellent booklet called "Photographing Television Images" (Pamphlet AC-10). Copies of this pamphlet are available to individuals free. To get ONE, send a self-addressed BUSINESS SIZE envelope to the Consumer Markets Division, Eastman Kodak Co. Rochester, N.Y. 14650. Be sure to mark "AC-10" somewhere on the front of your self-addressed envelope. No stamp is necessary.

An example of the wealth of information included in this booklet is the chart of suggested camera settings shown below. This chart should be helpful to those wanting starting information. However, the booklet includes data on close-up lenses, shutter speeds, color pictures, simple cameras, automatic cameras, movie cameras, and room conditions. Bob Emott, W2AI, tells me that he has a copy of this little guide and he thinks it's very helpful. OK Bob, how about some photographs for "in Focus"?

Pictures We Couldn't Resist Department

The other day, I happened to see a CQ aired by John Sink, WB4JEV, down Tennesee way. I thought it was a real cutie, so here it is in fig. 7, and after I mixed it up a bit on the Robot 300 in fig. 8. Sorry about that John, but I told you I'd have fun with that pixie-like character you extracted from a tool advertisement!

Dayton '77!

Dayton '77? No, I'm not kidding, Bob Zimmerman, W8DPW, DARA's peripatetic potentate of publicity implores slow scanners everywhere to reserve April 29, 30, and May 1, 1977 for that trek to Dayton.

In addition to the Hamvention's publicity, Bob edits the DARA's nifty newsheet *The RF Carrier*. That gang in Dayton really takes pride in working hard to do a good job.

Note to the Committee: The La Quinta Motel was much appreciated by the slow scaners last year, BUT at least TWICE as much room for the Friday night SSTV Seminar is a MUST for '77!

Final-Final—100 Countries SSTV Award? Yes! Yes! Yes!

Arrangements are now complete for a new CQ Award for those who have confirmed two-way SSTV exchanges with 100 countries. This award will be a part of the CQ DX Award Program and each certificate issued will bear a special SSTV endorsement.

John Attaway, K4IIF indicates that the new award will be available within the next month or two. How do you apply? Write to Rodney Linkous, W7YBX, 5632 47th Ave. S.W. Seattle, Wash. 98136 for your application blank and you'll be on your way! Rodney will handle all details of this award.

It's been a long time getting here, but a major award in recognition of slow scanners' achievements is finally at hand and I'm happy to have had a part in making it happen. Now I just hope that we can swamp Rodney with applications!

That about wraps it up for this time, except for saying, "Please write and SEND PICTURES!" It's so long since I've heard from Australia I'm about to start drilling through to see if it's still there! And how about some news from Africa? Send your letters to that far-away-place with the strange-sounding name: 2112 Turk Hill Road, Fairport, N.Y. 14450. Best regards, Bill, W2DD.

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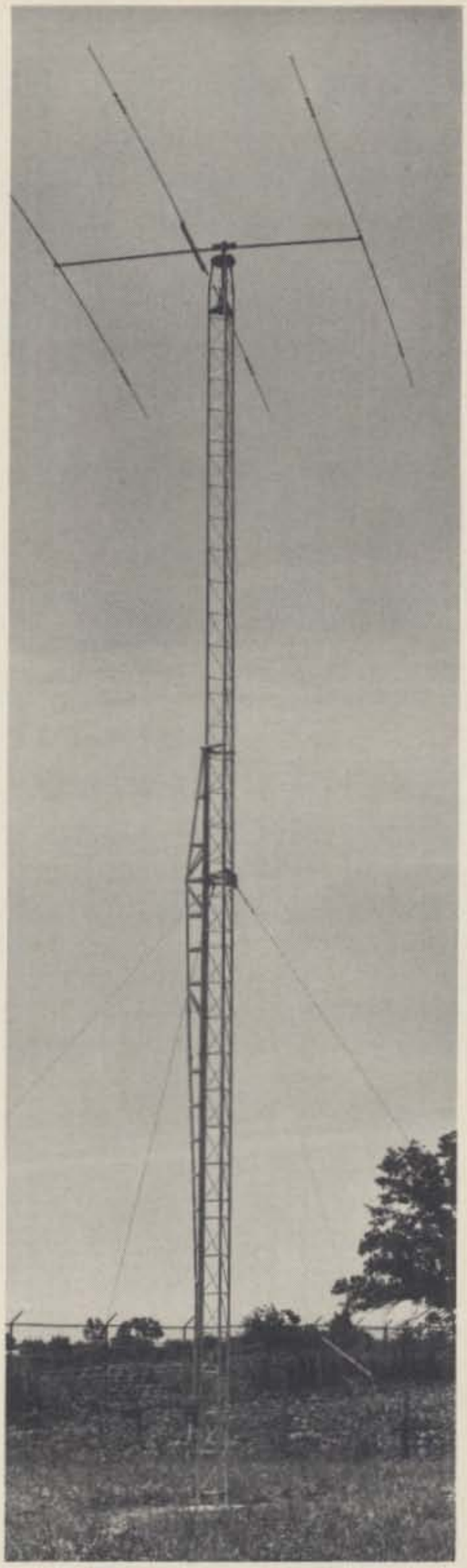

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CQ Reviews: The Kenwood TV-502 2 Meter Transverter

BY HUGH R. PAUL,* W6POK

In recent months we have seen a resurgence of c.w. and s.s.b. activity on the low end of two meters. While some of this activity is a result of increased interest in Oscar and some as a result of discontent with f.m. operation, I believe the majority is due to newer operators discovering the fun to be experienced in chasing DX and ragchewing on this band.

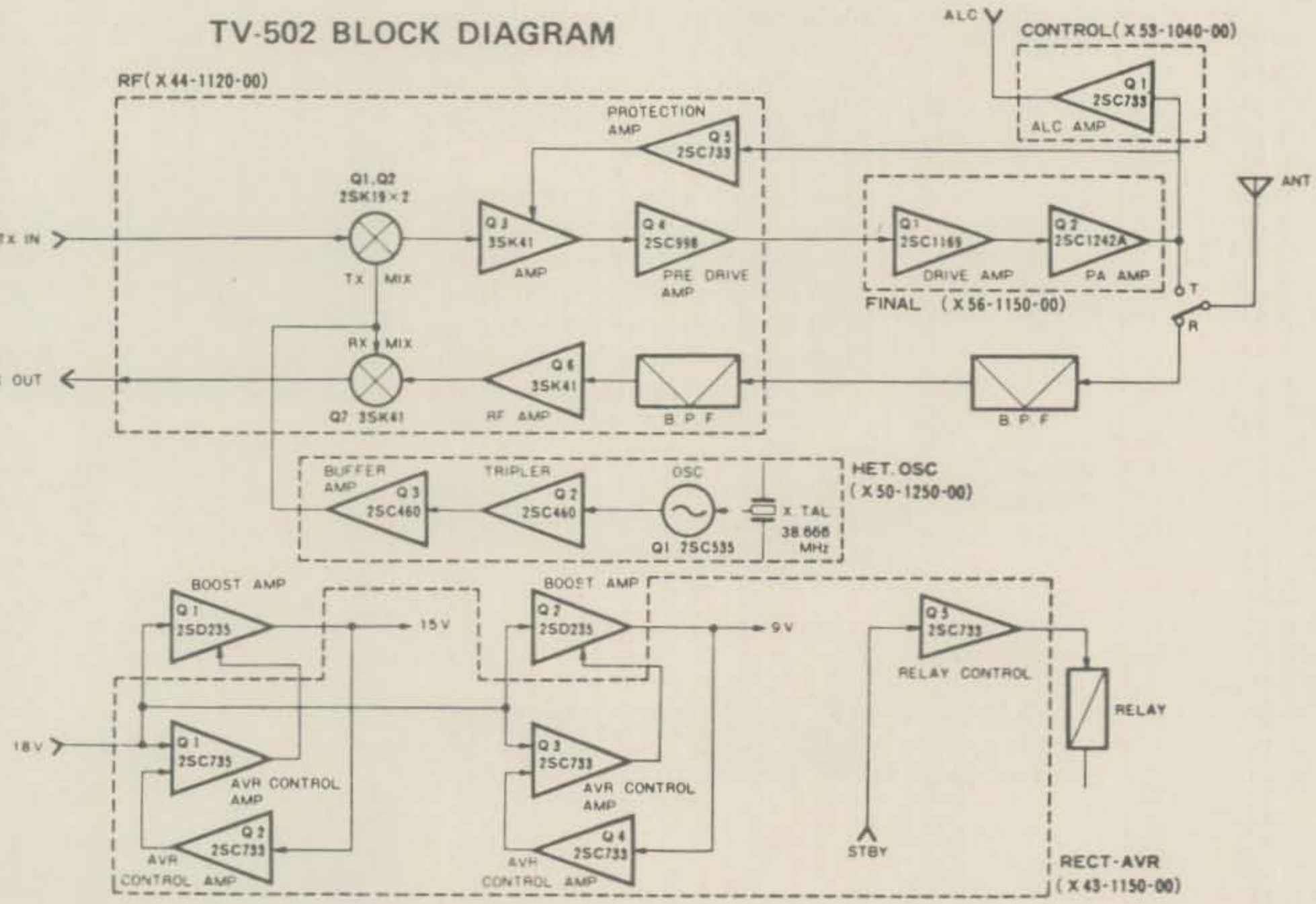
If you would like to get in on the fun, but don't care to take out a second mortgage on the house to purchase one of the new all mode transceivers on the market, allow me to suggest the perfect alternative. If you have a transceiver for the high frequency bands, all you need is a Kenwood TV-502 transverter. For just under $250 this unit gives you all of the performance on two meter c.w. and s.s.b. to be found in the all mode rigs.

While designed to connect directly into the Kenwood TS-520 and TS-820 rigs, the TV-502 is compatible with most transceivers provided you are willing to perform some slight modifications. The TV-502 has a built-in power supply, but does require −100 v.d.c. blocking bias from the high frequency transceiver during the transmit condition.

The transverter also requires a source of low level r.f. over the range of 28 MHz to 29.7 MHz. This would normally be taken from the output of the driver stage in the high frequency transceiver, which means that the final amplifier stage of the transceiver must be disabled during the transmit condition.

*291 Macalester Drive, Walnut, California 91789

TV-502 BLOCK DIAGRAM



The Kenwood TV-502 transverter shown along side the TS-820 transceiver. It can be used with other transceivers to give 2 meter c.w. or s.s.b. output. (photo by Sandra K. Paul)

The output of the receive converter in the TV-502 covers the range of 28 MHz to 29.7 MHz, thus the high frequency transceiver functions as a tunable i.f. in the receive mode. Switching functions between the transverter and the transceiver can be accommodated quite readily with existing circuitry in the majority of transceivers and the switching circuits provided in the TV-502.

The block diagram gives a pretty good indication of the circuitry involved in the TV-502, but a few points are worth mentioning. The second band pass filter is of the helical type and is very effective. The venerable 3SK41 dual gate FET is used as both r.f. amplifier and mixer in the receive section. The design of the receive front end contributes greatly to the low intermodulation characteristics of the unit.

Sensitivity of the unit is rated by Kenwood at better than 1 micro volt for a 10 db signal to noise ratio. Measurement of sensitivity varied with the particular transceiver being used with the transverter. Remember that the high frequency transceiver is the i.f. of the system and contributes accordingly to overall sensitivity. Depending on the type of transceiver used with the TV-502, a 10 db signal to noise ratio was achieved with as little as .7 micro volt and as much as 1.1 micro volt applied.

The TV-502 comes equipped with one crystal for the heterodyne oscillator. With the TS-520 and TS-820 which tune a 600 kHz range over each segment of the ten meter band, total coverage of the transverter is from 144 MHz to 145.7 MHz. An optional crystal may be purchased, which will extend the coverage to above 146 MHz. A second crystal position with its own trimmer is provided in the TV-502 and the desired crystal may be selected by a switch on the front panel.

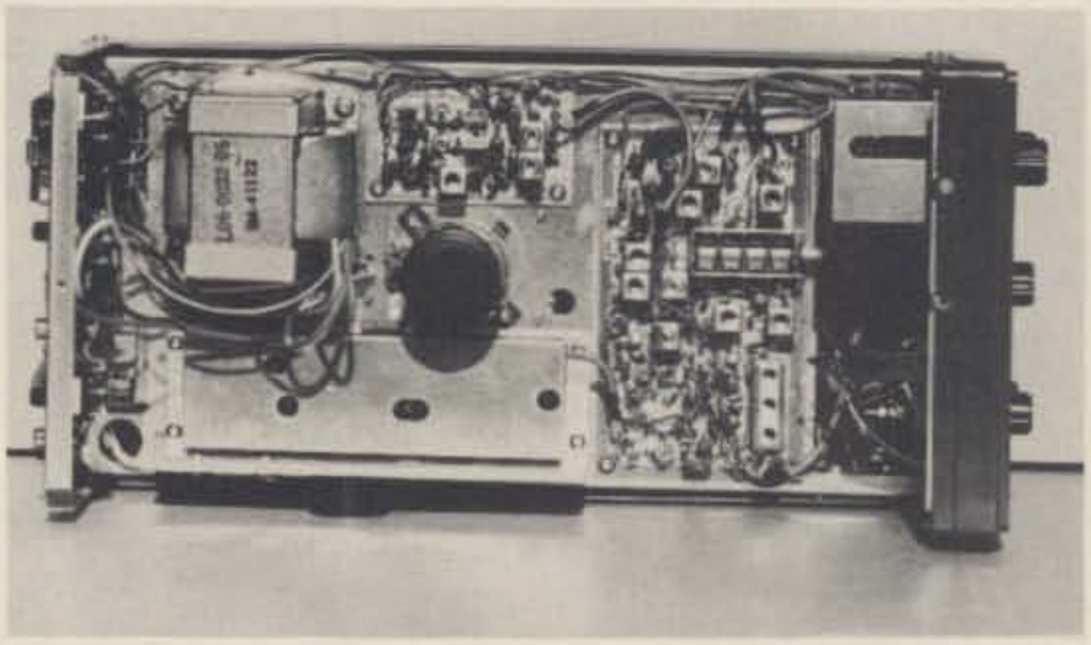
Kenwood rates stability of the transverter at better than plus or minus 2.5 kHz during the first hour after a one-minute warm up period and within 150 Hz per each 30 minutes thereafter. When tested with the TS-820 and TS-520 the total drift was well within specification. With some other transceivers this figure was exceeded by a considerable degree.

One distinct advantage of the TV-502 when operated in conjunction with a TS-520 was the high degree of frequency readout accuracy. The combination allows direct readout to 1 kHz, which is hard to beat with most of the all mode units presently available.

Another noteworthy fact was the lack of birdies when tuning from 144 MHz to 145.7 MHz. Only one was noted and it was far enough down in amplitude to be insignificant.

Careful attention has been given to the design of the transmitter section of the TV-502. The result is a clean signal and high reliability. Rated by Kenwood at 8 watts output the unit tested produced a consistent 8.2 watts out on c.w. An effective a.l.c. circuit is included and performed well with the

(Continued on page 74)



Interior view of the Kenwood TV-502 2 meter transverter. (photo by Sandra K. Paul)

Now with a little bit of effort, repeater fans, you can punch up dial telephones too.

A Push-Button To Dial Telephone Converter

BY IRWIN MATH*, WA2NDM

With more and more local telephone companies converting to push-button telephones, one would think that the day of the dial phone is rapidly waning. Although this may be in time there are still many more such phones in existence than the newer types and it will be quite a number of years before the dial telephone becomes extinct.

As a result, one manufacturer, Motorola Semiconductor, Box 20912, Phoenix, Arizona 85036, has just introduced (July 29, 1976) a BCD to Dial Telephone Pulse Converter called the MC 14408. This device will accept a BCD or binary entry, from 0 to 9 and provide a chain of pulses that can be used to dial a number on a conventional dial-phone system.

Another feature of this chip is the inclusion of a built-in memory that will "remember" the last number dialed and re-dial it by simply pressing an external switch—great when the number called is busy or the call is not completed for some reason. By interfacing this chip with another Motorola device, the MC 14419 keypad-to-binary converter, a complete push-button telephone, fully compatible with dial pulse systems, can easily be built, including the re-dial feature. Both chips incidently are of the CMOS variety and draw just a few milliwatts of power. For those who wish to experiment, we have

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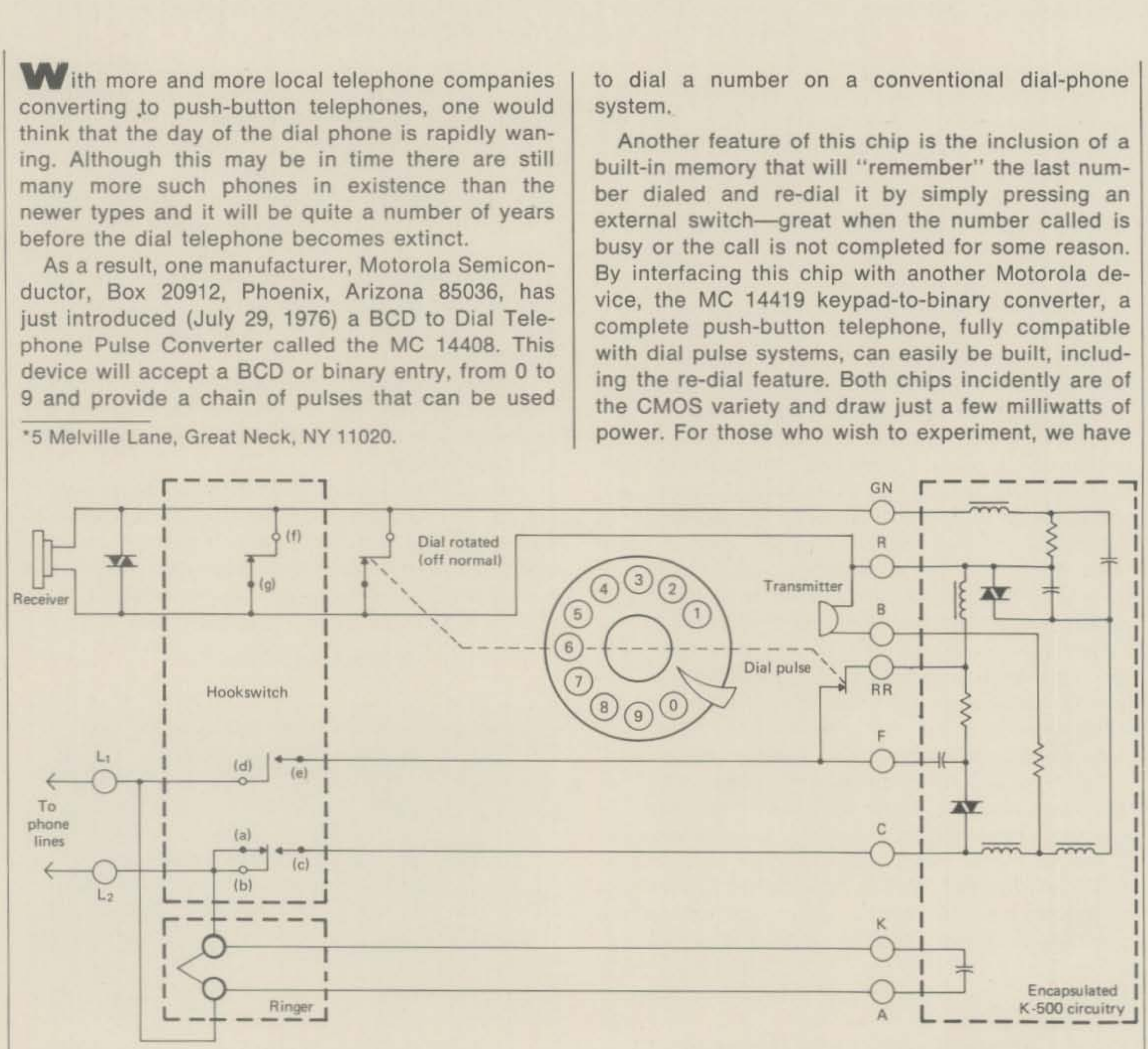

Fig. 1—Schematic of the standard K-500 telephone.

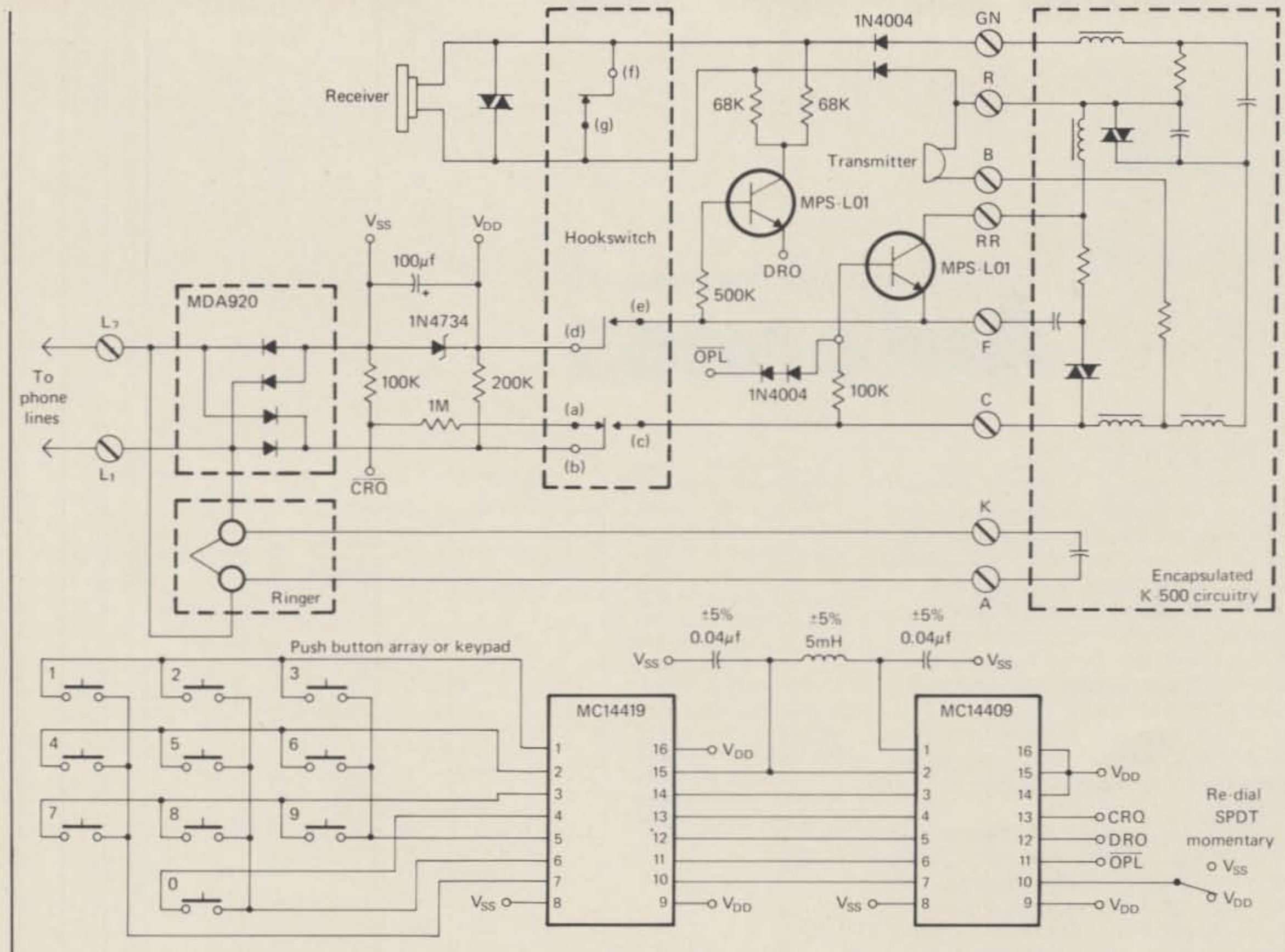

Fig. 2—Schematic of the modified telephone. All V_{SS} points go together, all V_{DD} points go together and, as described in the text, the MDA920 may be made up of 4 silicon diodes.

included some additional circuitry and details from the data sheet supplied by Motorola for the MC14408.

Fig. 1 is a schematic diagram of a standard K-500 telephone set, the most common one in use today. It is given for reference so a would-be-constructor can identify the various points in his phone.

Fig. 2 is a schematic of the entire push-button modified K-500 telephone. The dial is of course replaced by a group of 10 SPST normally open push-button switches, or a similar keypad. An eleventh, SPDT button is used for the re-dial feature. All power for the circuitry is derived from the telephone line as it is negligible in the standby condition (handset hung up) and just a few milliwatts in actual operation. Note that Q101 replaces the dial switch for dialing the actual number. Also, the MDA 920 input bridge unit may be replaced by 4 IN40045 or equivalent.

To use the modified telephone one simply lifts the handset, waits for a dial tone and then presses the button's in the correct sequence to dial a number. If the line is busy, or the call is not completed, one press of the re-dial button dials the number again. This redialing feature may be continuously repeated until a new number is dialed. The new number now replaces the old one in the memory. If the phone is a plug in type, removing the plug will remove B+ from the chip and the memory will be erased.

One modification to this circuit, for repeater owners, might be to connect 10 reed relays in lieu of push-buttons and drive these relays with the output of a tone system to enable "mobiles" to have auto-patch facilities in areas where telephone company push-button systems are not available.

Cost for the MC 14408 is only $6.98 in 100 quantity and probably under $10 for 1. Just a couple of precautions—we have not tried the circuitry given and are relying wholly on information supplied by Motorola. Also, local telephone company regulations may govern the installation of such circuitry on their lines. Finally, be certain to obtain data sheets from Motorola on these two chips and study them well before beginning construction. ■

WILLIAM I. ORR, W6SAI, ON

Antennas

"How's DX?", I asked.

"Pretty good," admitted Pendergast. He dropped the pen with a sigh and swept a pile of unanswered QSL cards to the side of his operating table. "Considering this is the bottom of the sunspot cycle DX has been amazingly good. I remember the bottom of the last cycle in summer of 1964. DX was *terrible* then. Why is it so much better now?"

"I don't know," I replied. "Better equipment. Better antennas. Better operators. A combination of all three?"

"Better antennas," Pendegast said confidently. "There are some pretty clever designs floating around, like 10 elements on a 160 foot tower . . ."

"Believe it or not, the greatest interest is in the simpler antennas. The majority of fellows can't put up the 160 foot tower, or anything close to it. Most of my mail consists of information about — and requests for — simple antennas. Small ones for apartment dwellers and fellows hassled by neigrbors, building inspectors and various restrictions."

"What about that loop antenna you have up on the garage?", demanded my friend.

"A good case in point", I replied. This design is based upon an article on folded dipoles and loops that appeared in the March, 1961 issue of *IRE Transactions on Antennas and Propagation*. The article was a comprehensive, theoretical study of antenna types done by C.W. Harrison, Jr. and R.W. King of the Sandia Corporation and Harvard University, respectively. A portion of the article concerned itself with the "halo" antenna (figure 1).

"The folded dipole style of halo has been used with some success as a mobile antenna for 6 and 2 meters and also is used for f.m. broadcasting. The dimensions of the dipoles can be adjusted to provide a good match to a 50 or 70 ohm line. Its a tough job to construct, however, especially for the lower frequencies.

"The single conductor halo, on the other hand, is very easy to construct, and that's the one I am testing at the present time. The input impedance of

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Fig. 1—The folded circular loop, or Halo antenna. When the folded dipole is bent into a Halo antenna the input impedance drops from 288 ohms to 86.5 ohms. The antenna exhibits positive reactance because of the capacity between antenna tips. By changing the diameters of the conductors, the input impedance can be adjusted to match a coaxial line. A single conductor Halo has an input impedance of 15.7 +j75.3 ohms.

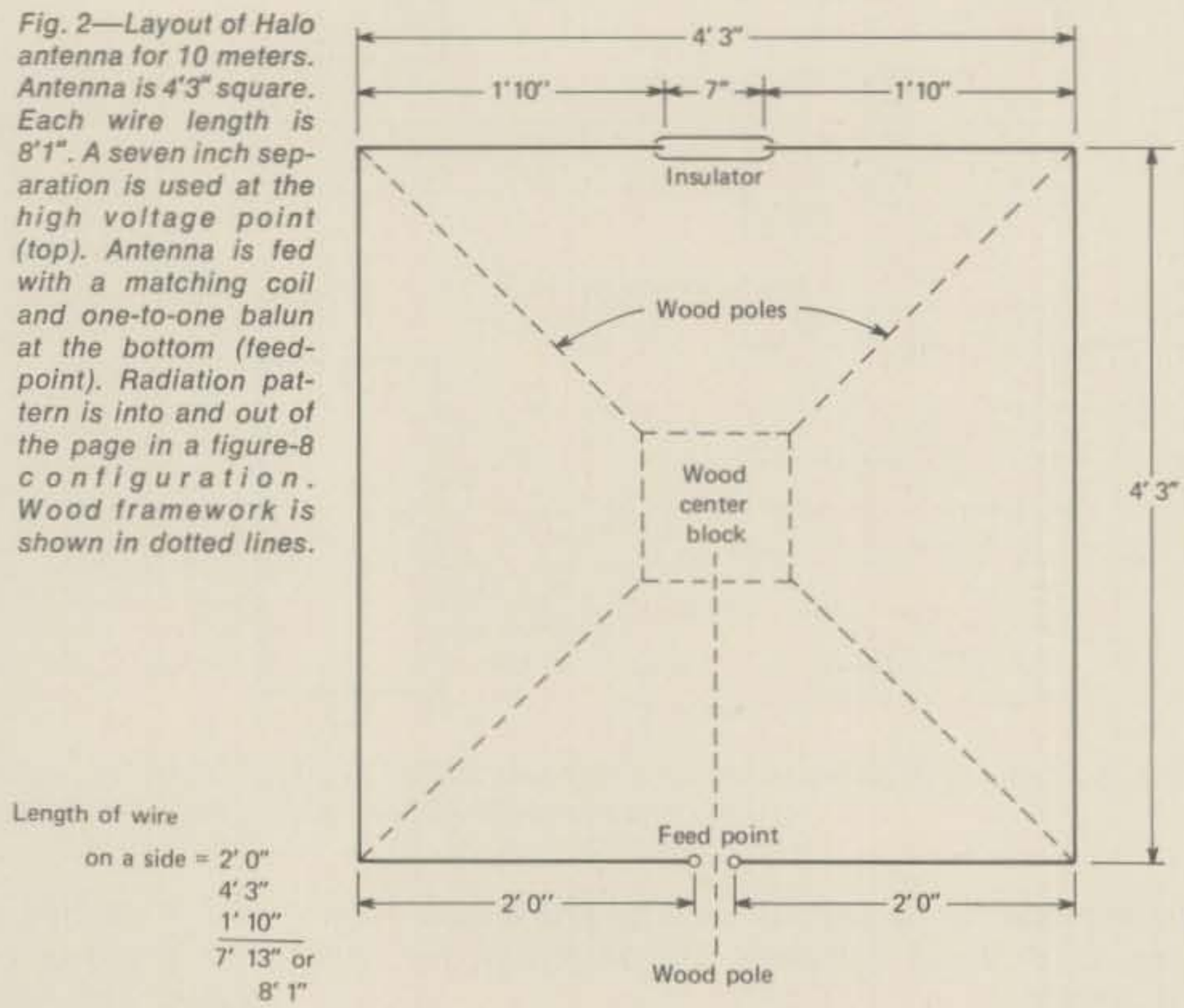

Fig. 2—Layout of Halo antenna for 10 meters. Antenna is 4'3" square. Each wire length is 8'1". A seven inch separation is used at the high voltage point (top). Antenna is fed with a matching coil and one-to-one balun at the bottom (feedpoint). Radiation pattern is into and out of the page in a figure-8 configuration. Wood framework is shown in dotted lines.

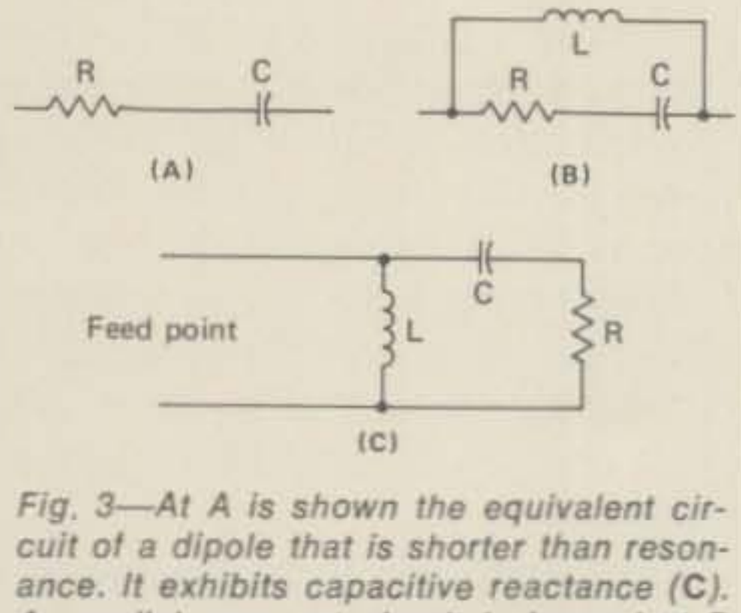

*Fig. 3—At A is shown the equivalent circuit of a dipole that is shorter than resonance. It exhibits capacitive reactance (**C**). A parallel resonant circuit is formed at B with the addition of inductor, L. The equivalent L-network is shown at C.*

this design, however, is quite low. According to the article, it runs about 16 ohms. In addition, the halo antenna should be cut a bit shorter than an equivalent dipole running in a straight line."

"What's your design?", asked Pendergast, as he pulled his ever-present notebook out of his attache case and prepared to make notes.

"Well, the design is shown in figure 2. Basically, it is a half-wave dipole bent into a square and mounted in a vertical position. It has the same radiation pattern as a regular dipole. My antenna is for 10 meters, but there's no reason why one couldn't be built for any h.f. band. Look! The 10 meter version is only a little over four feet on a side! That's small enough to be turned by the flimsiest of TV rotators."

"Let's talk about the electrical characteristics first", requested my friend.

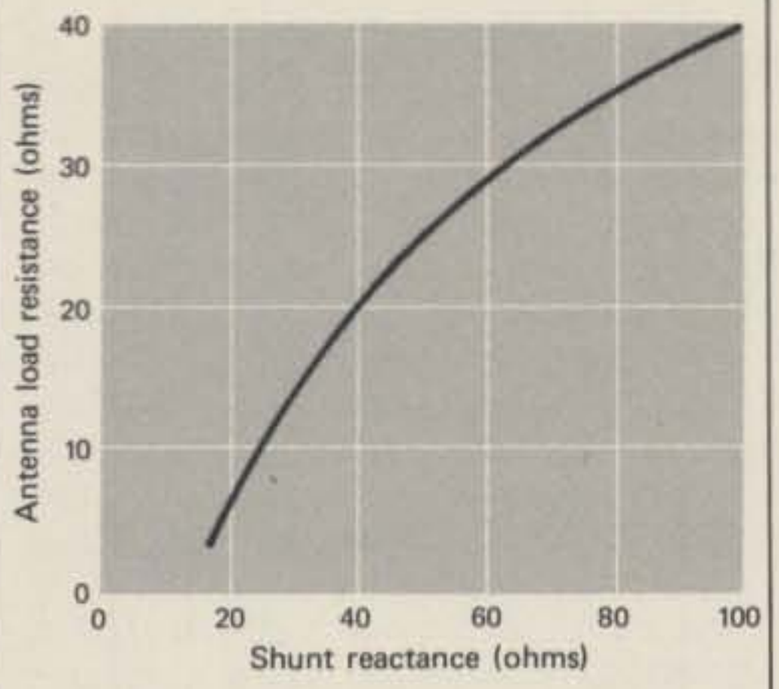

Fig. 4—Shunt inductive reactance required to establish transformation from antenna load resistance (y-axis) to 50 ohm coaxial line. Reactance can be translated to inductance for various amateur bands by using reactance chart and inductance chart in recent ARRL handbooks.

"Very well," I replied. "In order to match the 16 ohm input impedance it is necessary to provide a simple matching network for a 50 ohm coaxial line. This can be done by forming an equivalent parallel resonant circuit made up of the input impedance of the antenna and a shunt coil. If the antenna is slightly shorter than resonance, it looks like a series circuit at the terminals so all that is required is the coil placed across the antenna terminals, as shown in fig. 3

"Without going into the mathematics of it, the data in figure 4 translates everything into practical terms if you know the input impedance, or radiation resistance, of the antenna. For this little mini-loop, it is 16 ohms. To match it to a 50 ohm line, the inductor required has a reactance of about 35 ohms."

"How do I get from inductive reactance to the nitty-gritty of how-many-turns?", asked Pendergast.

"The easiest way is via a reactance chart, such as on page 44 of the 1976 edition of the *ARRL Handbook*. According to the chart, a reactance of 35 ohms on the 28 MHz band is equivalent to an inductance of about 0.2 microhenries. You can now trans-

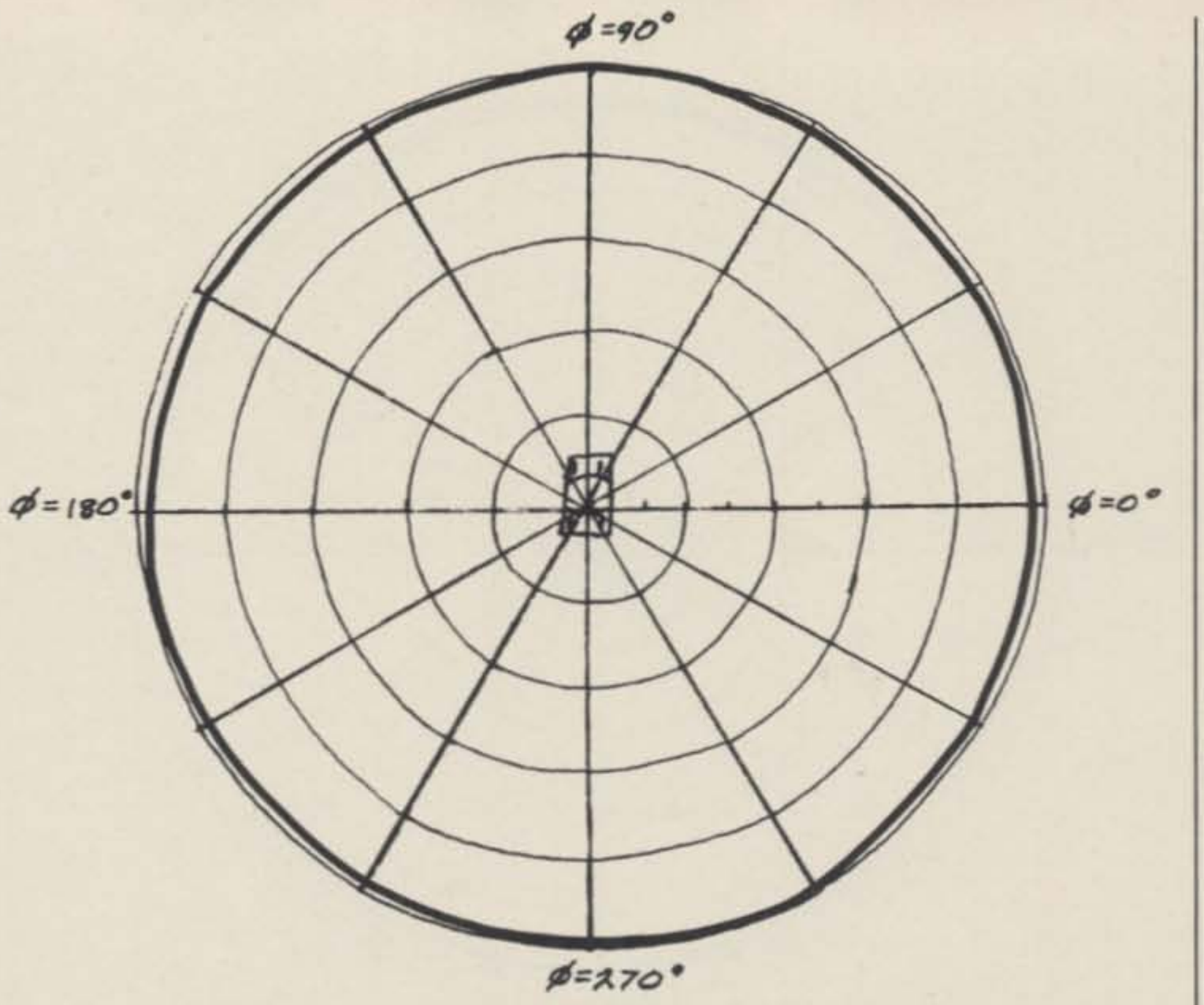

Fig. 5—Typical free-space horizontal plane pattern of vertical antenna mounted in center of roof of automobile. Drawings courtesy Communication News, *a Harcourt Brace Jovanovich publication.*

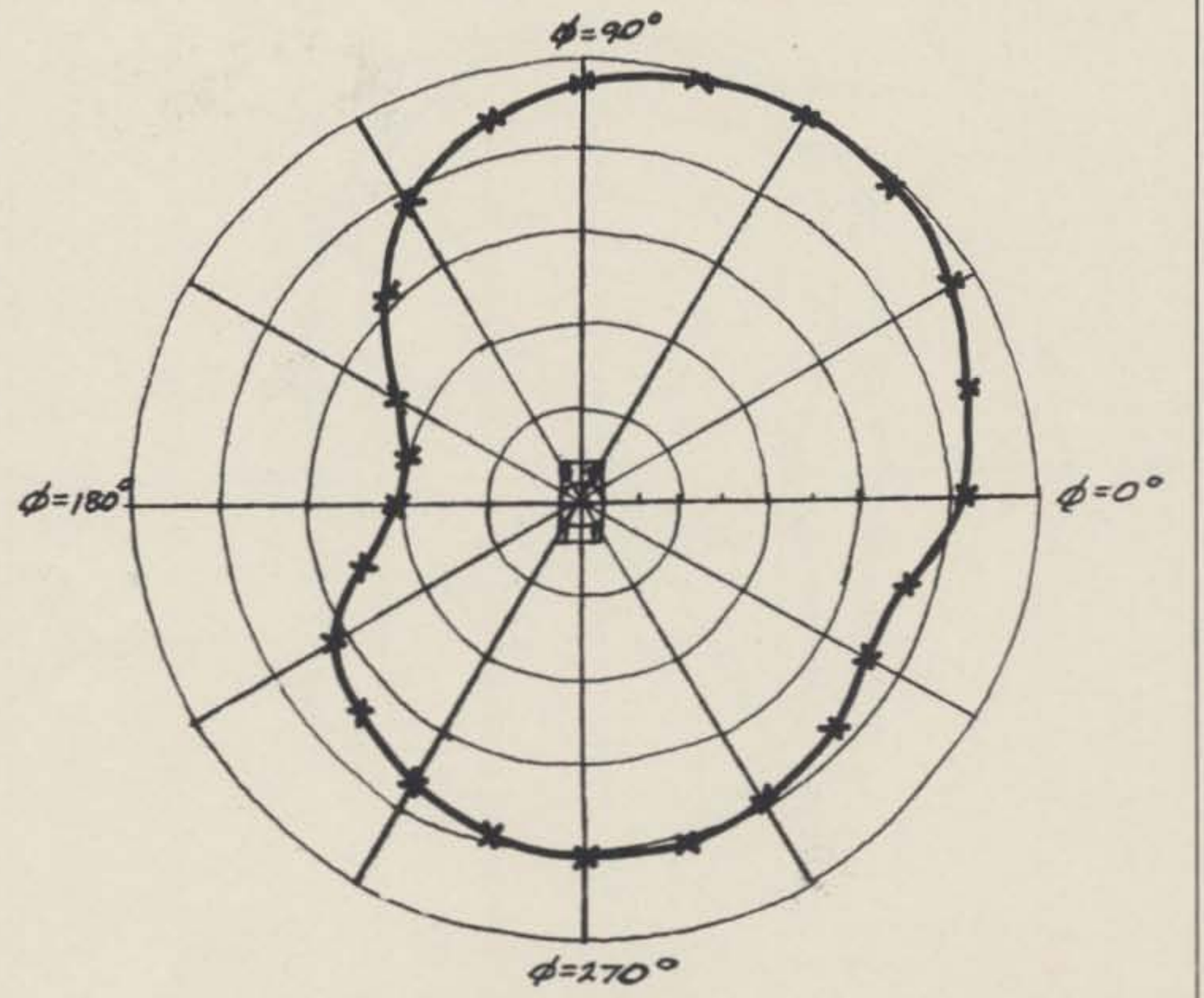

Fig. 6—Field intensity plot for whip antenna mounted on left, rear vehicle bumper. Field strength is down about 6 dB to left of vehicle.

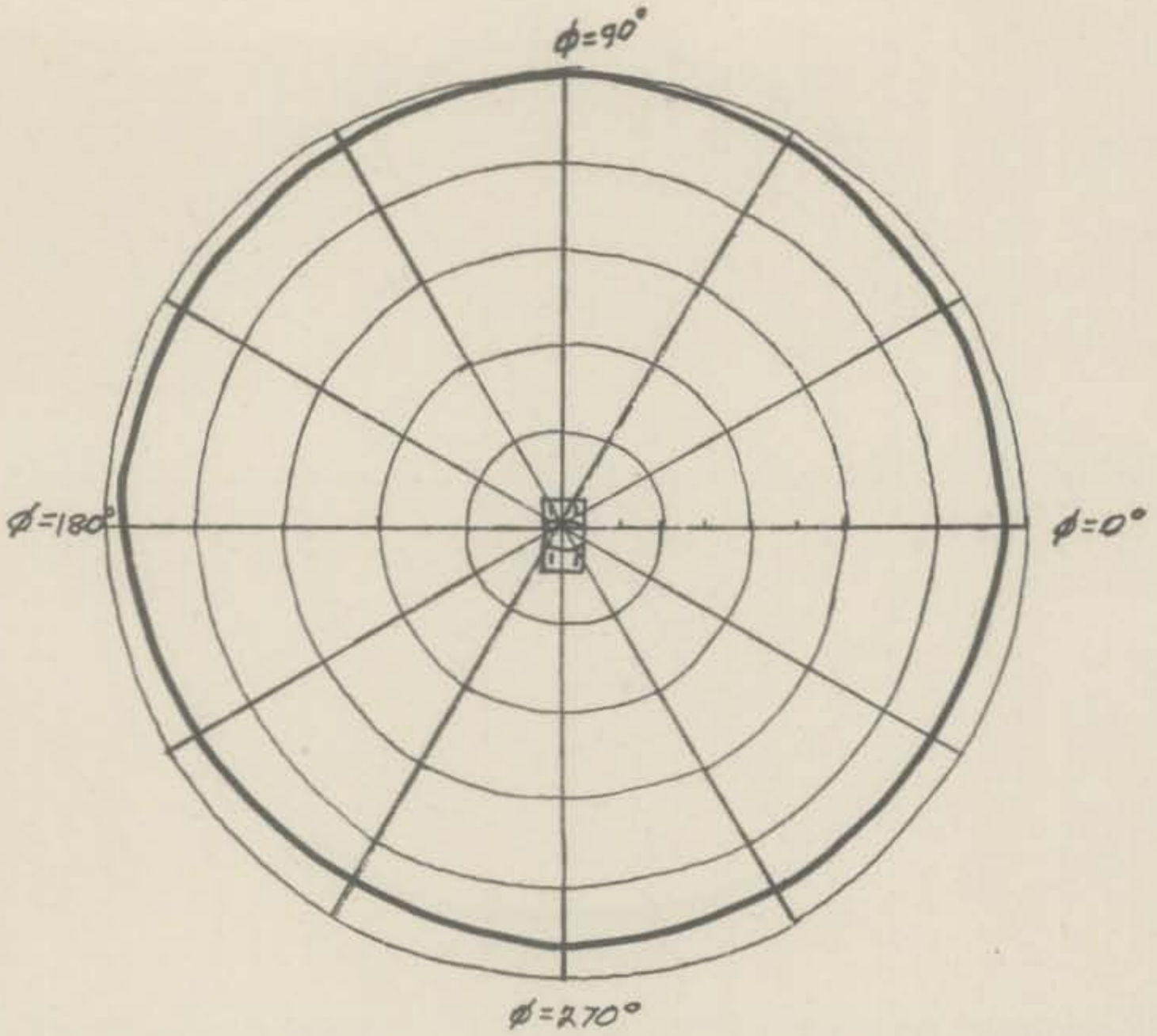

Fig. 7—Field intensity plot for whip antenna mounted on trunk of vehicle. Pattern is nearly omnidirectional.

late this into a real-life coil by turning to the inductance chart on page 27 of the same handbook. An inductance of 0.2 microhenries is equivalent to about 5 turns of #12 bare or enamel-coated wire, ½ inch inside diameter and wound at 8 turns per inch. The coil is therefore ⅝ inch long."

"Why don't they place the two graphs on one page?", grumbled my friend.

"Well, they want you to think a *little*", I replied. "Now, once you have figured out the coil and mounted it across the antenna terminals, the last step is to place a 1-to-1 balun transformer between the feedline and the antenna terminals. The coil, antenna and balun connections all are in parallel at the feed point.

"The s.w.r. curve of the mini-loop is quite sharp, providing a bandwidth of about 250 kHz. By adjusting the coil and the length of the wire in the loop, however, it is easy to zero-in at your pet operating frequency. My loop is adjusted to 28.6 MHz and works great from 28.5 MHz to 28.7 MHz. And the s.w.r. is less than 2-to-1 across that range".

"Now, how does it all go together?", demanded Pendergast. "You must remember that all the tools I have are a hammer and a dull Boy Scout knife!"

"No problem at all", I laughed. "My mini-loop was made of materials from the local hardware store. I used a square piece of plywood for the center plate. The wood pole and the arms are made out of 1-inch diameter hard dowel rod. The poles are clamped to the plywood plate with small U-bolts. Holes are drilled in the tip ends of the dowels for the antenna wire. The #16 antenna wire is strung through the holes and fastened to the top insulator. This must be a good insulator with a long leakage path, as it is at a point of high potential. I used two, 3-inch ceramic insulators in series. Once the loop is assembled, the center U-bolts are loosened a bit and the dowel rods pushed out to tighten the wire. And I gave the wooden framework a coat of boat varnish to make everything waterproof.

"The wood pole is jammed into a support pipe. You don't want the pipe to come up into the electrical field of the antenna, so there's a section of pole that extends under the loop for nearly two feet. The support pipe is a TV slip-up mast, shimmed at the top to make a tight fit with the wood pole. I use a TV rotator to turn the little loop".

"How does it work?", asked Pendergast as he continued to make graceful drawings in his notebook.

"Damn good", I replied. "It doesn't have the sock of my beam, but I've worked plenty of short, summer skip on 10 and have gotten excellent reports. It seems to be down about 6 db on direct comparison tests with the beam, which is about right, I guess".

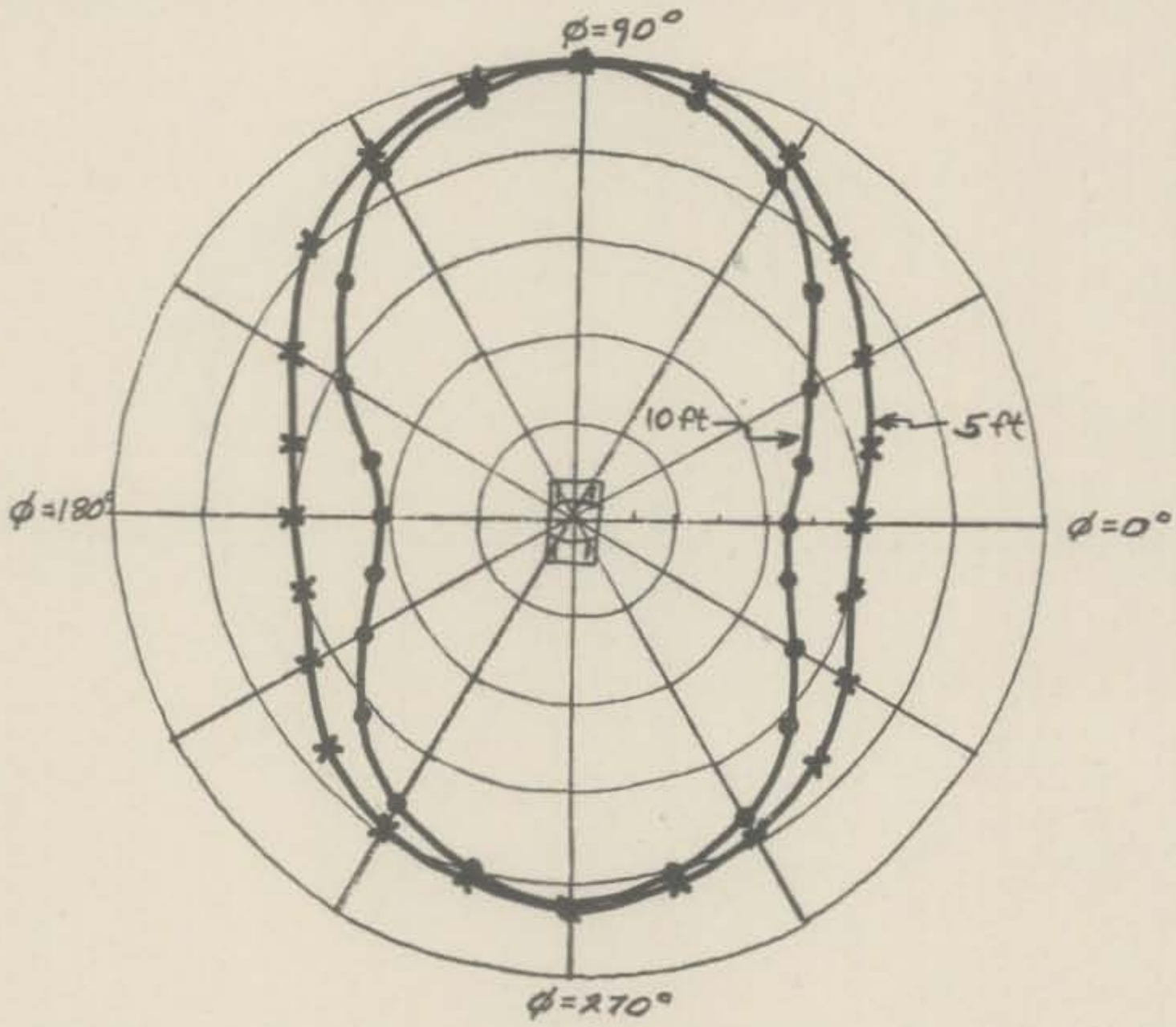

Fig. 8—Co-phased whip patterns with 5 and 10 foot separation show deep nulls to the sides of the vehicle. Ten foot separation provides 6 dB nulls, whereas 5 foot separation shows 4 dB nulls.

"Looks like a nice job for portable operation", observed my friend. "In fact, if it was just a little bigger, it would make a good CB antenna".

"Perish the thought," I replied.

"Speaking of CB antennas", said Pendergast, as he pulled a large magazine out of his jacket pocket, "Did you see the article on co-phased mobile whip antennas in the June, 1967 issue of *Communications News*? It is written by Dave Rayburn of Breaker Corporation and he discusses the operation of twin whips on an automobile or truck. Lotsa CBers use twin whips, but I've never seen a mobile amateur installation with twin whips. Is it a good idea, and why not use it on 10 meters?"

"Slow down", I said. "I remember some of the early 80 meter mobile operators used twin whips, connected in parallel, in order to reduce corona effects when running high power a.m. That was a long time ago. But the CB twin whips are different in that they are co-phased in the broadside condition. Theoretically, this is a simple bidirectional beam antenna. Look at figure 5. That's a field intensity plot of a single vertical whip antenna mounted on the center of a vehicle roof. A nice, omnidirectional pattern. But look at figure 6. Now the whip is mounted on the left, rear bumper of an automobile. The field pattern is all screwed up, with most of the radiation over the right, front fender direction and very little to the left of the vehicle.

"Now, when the whip is mounted on the trunk of the vehicle, the pattern is more omnidirectional, as shown in figure 7. This is not bad.

"But the problem arises as to antenna placement on the big semi-rigs, or "sixteen wheelers", as the CBers call them. About the only clear location for an antenna — away from the body of the vehicle — is on a side mirror mount. And that gives a skewed pattern similar to that of the bumper mount.

"The final solution is to use two whip antennas, co-phased, mounted on each mirror mount. Co-phasing is simple — just use equal lengths of coaxial line and connect the lines in parallel at the transmitter. When that is done, the antenna field pattern resembles that shown in figure 8. With 5 foot separation, the pattern is figure-8 shaped, in-line with the body of the vehicle. Radiation off to the sides is down about 4 decibels compared to the field strength in-line with the vehicle. Five foot separation is about that found on most automobiles".

(Continued on page 73)

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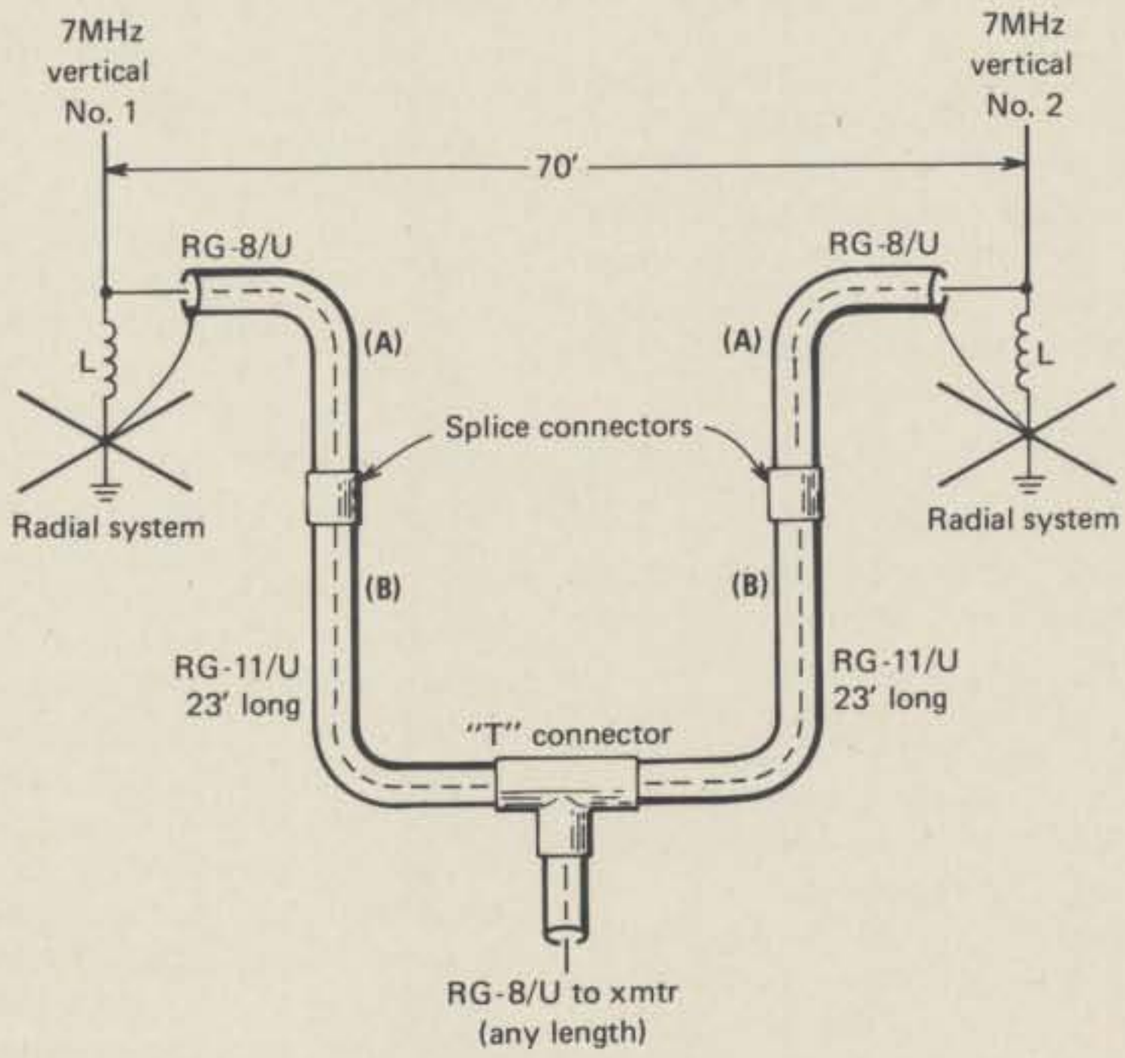

Fig. 9—Co-phased vertical antennas for 40 meter band. Each antenna employs matching inductor (see figs. 3 and 4) to bring base impedance up to 50 ohms. Forty meter vertical exhibits typical base impedance of about 40 ohms, so shunt reactance (L) of 100 ohms is required. This works out to 2.3 microhenries at 7 MHz. This would equal 12 turns #14 wire on a 1-inch diameter form, wound 10 turns per inch. Length of line sections (A) is unimportant, so long as the lengths are equal. Line sections (B) are each 23 feet long to tip of plugs. Length of antennas and base inductors are adjusted to provide low s.w.r. on 50 ohm line to station.

Novice

BY HERBERT S. BRIER, W9EGQ

Effects of The New Novice, Technician, And Conditional Rules

In summary, the new FCC rules that became effective July 23, 1976, raised maximum Novice transmitter power from 75 watts to 250 watts, d.c. input and reduced the maximum power that higher class licensees can use in the Novice bands to the same maximum value deletes the 1-year waiting period between holding any class of amateur license and a subsequent Novice license, and grants Technicians full Novice privileges. There are no changes in the method of obtaining a Novice license, but the Novice license is now the only U.S. amateur license normally obtained by mail.

The new regulations make Technician (C) and Conditional class licenses obtained by mail equivalent to Technician and General class licenses obtained at an FCC examination point. Thus, any Technician can qualify for a General class license by passing the 13-w.p.m., General class code test before an official examiner, and Conditionals may qualify for Advanced class licenses by passing the Advanced class written exam under the same conditions. Except for physically-handicapped persons, however, all applicants for Technician and higher-class licenses must take the total examination (including the Novice element) before an official FCC representative.

Handicapped persons send their 610 B application forms and doctors' certificates to their district FCC offices (not Gettysburg, Pa.) The FCC will then appoint a volunteer examiner to conduct the appropriate examination in the applicant's home or other convenient place. Reportedly, the FCC will act on applications for temporary licenses for U.S. personnel stationed overseas on an individual basis.

*409 So. 14th St., Chesterton, Ind. 46304.

*The New Novice Power Limit**

*For the record, the ARRL Executive Committee voted immediate opposition to the new Novice band power order, even before seeing the document. The vote is not expected to have much influence on the order.

Increasing power from 75 watts to 250 watts is an increase of 5 db. An "S" unit on the RST scale represents a power change of 6 db (4:1). Consequently, the increase will bring up average signal reports a scant S unit, a significant but not overwhelming increase. In fact, the greater selection of equipment at the 250-watt range compared to the 75-watt region is probably its major advantage. By investing in a modern c.w./s.s.b. 3.5 (or 1.8) to 29.7 MHz transceiver or a matching transmitter and receiver, the purchaser can use it on c.w. in the Novice bands with a Novice or Technician license and on the General class phone and c.w. bands when he qualifies for that license.

If first cost and space are not major factors, separate matching transmitters have much to recommend them. They are more versatile than a transceiver. Because the receiver and transmitter can be designed to do their best jobs without compromises, they usually work better in each function than a transceiver. In addition, they can be operated in the "transceive" mode or as independent units by the flip of a switch. On the other hand, the compactness, economy, and ease of operation of the transceiver—which uses many components bilaterally and automatically transmits and receives on the same frequency—makes the transceiver the choice of the majority of amateurs.

Some transceivers feature incremental tuning, which permits tuning in received signals a few kHz each side of the transmitted frequency without affecting the latter. Others have facilities for an external v.f.o. that makes it possible to transmit and receive on widely separated frequencies. Serious DX'ers find such split-frequency operation particularly valuable when chasing rare DX stations that never answer calls on their own frequencies. Many other optional accessories are available for both transceivers and separate receivers and transmitters. Of special interest to Technicians are converters that extend the frequency range of some of them to the 50 and 144 MHz amateur bands.

When evaluating equipment, high receiver selectivity and sensitivity, ease of operation, and freedom from overload from strong local signals are more important than a few extra watts on "transmit." Bear these facts in mind when you discover a number of transmitters and higher-priced transceivers have lower power ratings than lower-priced transceivers. The latter often uses TV sweep tubes as r.f. power amplifiers capable of handling up to 500 to 600 watts, PEP, on s.s.b. per pair with moderate distortion, but with a key-down duty cycle of only a few seconds. In contrast, more conservatively-rated units may use r.f. amplifier tubes of the 6146B class with a s.s.b. PEP power input rating of 250 watts or so and a c.w. power rating of around 180 watts. The few all solid state transceivers available also have power ratings in this range, because of the rarity and high-cost of high-power r.f. transistors.

In selecting units that will actually be used on c.w. as well as s.s.b., do not be too impressed with high PEP ratings on s.s.b. One hundred fifty up to 300 watts on c.w. will usually make as many contacts as several times that power on phone. The excitation/drive control serves as an efficient power level control, if the maximum power input starts to creep over 250 watts. Speaking of power, if your pocketbook is more compatible with 75-90 watt HW-16's and DX-60B's,

etc., than with more-elaborate s.s.b./c.w. transceivers, do not think they are now obsolete. They are holding their own in the General c.w. bands as well as in the Novice bands every day of the week.

Philosophically, we have mixed feelings about higher class licensees having another privilege chipped away by being restricted to 250 watts in the Novice bands. Two-hundred-fifty watts was more power than most of us used in the Novice bands; and the restriction emphasizes that many of us, apparently including the FCC, felt that it was "dirty pool" for a small minority of higher class amateurs to abuse the privilege of running high power by using their 1000-watt amplifiers to punish Novices who did not give them a clear channel when they moved into the Novice bands to "help" them. Theoretically, with everybody limited to the same maximum power in the Novice bands, Novices will have a fighting chance against these characters.

News And Views

We wonder if members of the Maple Hill High School Amateur Radio Club, WB2YCR, Castleton-on-Hudson, New York 12033, know how fortunate they are to have John Kienzle, WA2UON, of the African Studies Department as their sponsor and faculty advisor. Under John's supervision, every year the club turns out a new crop of Novices and graduates some of them as Generals. The latest of the latter is Jim "General" Zalinka, WA2ZFF, who had a friendly competition with his father, John, as to which would get his General ticket first. Both tickets arrived in the same mail. John is WA2YGL. They share a Heathkit SB-303 and SB-401 combination working with a multiband vertical.

What helps makes the Maple Hill ARC unique is not that it turns out new licensees; rather it is that they know how to use their licenses. The club station WB2YCR is operational on 2-meter f.m. as well as on the lower frequency phone and c.w. bands. With licensed operators in control, other club members learn to tune in signals, tune the transmitter, keep the log, how to call stations, give signal reports, fill out and send QSL cards; in fact, how to operate an amateur station under actual conditions. The station's latest activity is transmitting and receiving slow-scan TV pictures with donated home-brew equipment!

The club also goes out and demonstrates Amateur Radio to civic groups, such as the Kiwanis club and on field trips. The latest trip was to the Biomedical Electronics Division of the Albany Medical College, where Chuck, W2LO1, A1, WN2HFT, and Junior, WB2HNN, demonstrated how Electronics are used in medicine and in teaching medicine to future physicians.

Alfred T. Lorona, WN6FSF, 415 Edwin Aldrin Circle, Montebello, California 90640, became interested in Amateur Radio through his dad, W6WQC. He is an Electronics Major at Don Bosco Technical Institute in Rosemead, Calif., but he has found time to work 41 states and 10 countries on 15, 40, and 80 meters using a Heathkit DX-60B transmitter SB-301 receiver and multi-band dipole antenna. He encourages more Novices to try 15 meters. We are sending WN6FSF a 1-year subscription for CQ as this month's winner of our Monthly Photo Contest. If you wish to try your luck, send a clear picture, preferrably black and white, of you at the controls of your station with some details of your radio career to: Photo Contest, C/O Herbert S. Brier, W9EGQ, Novice Editor, CQ, 409 So. 14th St., Chesterton, Ind. 46304.

Greg Livingston, WN2EHV, 24 Lyncrest Ave., New York City, N.Y. 10956, is a "retread." He was originally licensed in 1969 as WN2JHS. This time, the inoculation took and he will soon be signing his new General call. Greg uses a crystal-controlled 6AG7 oscillator driving a pair of 807's, a Radio-Shack DX-120 receiver, and a 80-meter inverted-V antenna. By doing most of his operating after midnight when interference is least, he has worked 23 states in two months. A home-constructed c.w. filter improves the selectivity of the receiver. Greg is a symphony musician. He reports that he does not have much trouble with the code, but the theory comes a little harder . . . **Dave Hanson, WNØSHI,** and his dad, **Don, WNØSHH,** 3921 Effress Rd., White Bear Lake, Minn. 55110, attended a Novice class sponsored by the Minneapolis Radio Club last winter and are now studying for their Generals. Using a Heathkit HW-16 c.w. transceiver driving a 40-meter dipole 22 feet high, Dave worked 13 states (10 confirmed), plus one foreigner (Canada?) his first two weeks on the air. Dad may get a chance at the key later.

If you are within range, you are invited to report into the Indiana Novice Net (INN) on 3740 kHz. It meets Monday through Friday at 5:30 p.m., Central time.

You are also invited to send your News And Views, Pictures and suggestions of topics for discussion to your column. You do not have to be a Novice or Technician to contribute. Send all mail to: Herbert S. Brier, W9EGQ, Novice Editor, CQ Magazine, 409 South 14 St., Chesterton, Ind. 46304. 73, Herb, W9EGQ

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QRP

Major R.F. Loop Considerations: Part VI

Let's continue the discussion of major r.f. loop completion begun in the July column. As we noted there, higher level r.f. amplifier stages (above 4 watts input or there-abouts) require variations in treatment because of the high d.c. and r.f. current levels present, and because of the greater intensity of the r.f. field generated by such stages. The same general rules concerning by-passing and isolation mentioned earlier apply in such high level stages, but parts selection and placement become more critical as d.c. and r.f. current levels increase beyond several hundred milliamperes.

1.) **D.C. Current Loop.** Bear in mind that, when working with solid state amplifiers with a 12-13.6V B+ operating level, the production of 3 watts of r.f. output (assuming 50% collector efficiency) requires about 500ma at 12V, a current figure that only the high power boys had to contend with in the days of tubes. I recall that my old Globe Champion pulled about 325ma to the final for an input power of about 350 watts, and the B+ r.f. choke was huge! The reason for its size is simple. When dealing with such current levels, power loss due to ohmic resistances increases drastically, a factor which few QRPp homebrewers take into consideration. For example, the Globe Champ used #16 wiring for the B+ final leads because of the current level. And yet, check out most QRPp transmitters (homebrew or commercial), and it is likely that you'll find #24 or #26 "ma bell" hookup wire carrying currents in excess of an ampere! The intermittent duty cycle of c.w. and s.s.b. serves to veil the heating caused by IR loss, but it's still present nonetheless. Length is an important factor. Fortunately, most QRPp rigs are small and require only very short leads in high-current paths, a situation which results in usually negligible loss.

However, the major d.c. and r.f. current loop can require uses of appreciable lengths of wire, particularly in the form of r.f. chokes and inductance windings. It is in these two applications that a very significant loss factor can occur. Minimizing the loss factor is accomplished by switching to larger size copper wire. If the collector circuit requires an r.f. choke for decoupling and isolation purposes, the best practice is to use a #18 or #20 winding on a high $m\mu$ ferrite core to produce the required inductance for the r.f. choke. The high $m\mu$ core greatly decreases the actual length of wire, and since the fewer turns necessary to achieve the required inductance permits the use of larger wire, the d.c. resistance of a large r.f. choke—500 μh, for example—can be reduced to almost nothing. For complete details on the ferrite cores and jumbo beads that can be used for r.f. choke applications, see "Iron Powder/Ferrite Toroids and Beads," the QRPp column for November, 1975, p. 58. The same rationale applies to matching and output networks in which an inductance carries high level d.c. current (see fig. 1).

Other sources of d.c. resistance in a high level r.f. amplifier should also be mentioned. It is unwise to trust the chassis ground as a B— return path due to the fact that the metal spacers which establish the connection between chassis and p.c. board ground foil can become corroded, jarred loose, or make improper contact when installed. A good practice when mounting p.c. boards is to clean all surfaces which come into contact to establish the ground-via-spacer return path. Otherwise, resultant poor connections can introduce considerable d.c. resistance into the high current path. Usually, poor physical-electrical connections can be detected by their intermittency — power levels will switch up and down erratically without any detectable pattern. Hence, it is an adviseable practice to provide, in addition to the chassis ground, a wire lead path from the ground foil of a high level r.f. amplifier p.c. board directly to the B— supply voltage terminal. Similarly, solder joints that are poorly made, or that have corroded over a period of time, introduce appreciable d.c. resistance. When making solder connections, prepare wires, leads, foil strips, and transistor mounting strips by cleaning them to a shine, and melt the solder by touching it to the joint—not to the tip of the soldering gun. Let a hefty amount of solder flow onto the high-current joint and be sure a good shiny blob of solder results when cooled. This is simple basics, but so important. Some careful builders follow the practice of adding a stream of solder along the length of any high-current bearing p.c. foil strip so as to minimize resistance. In short, care must be

*83 Suburban Estates, Vermillion, SD 57069

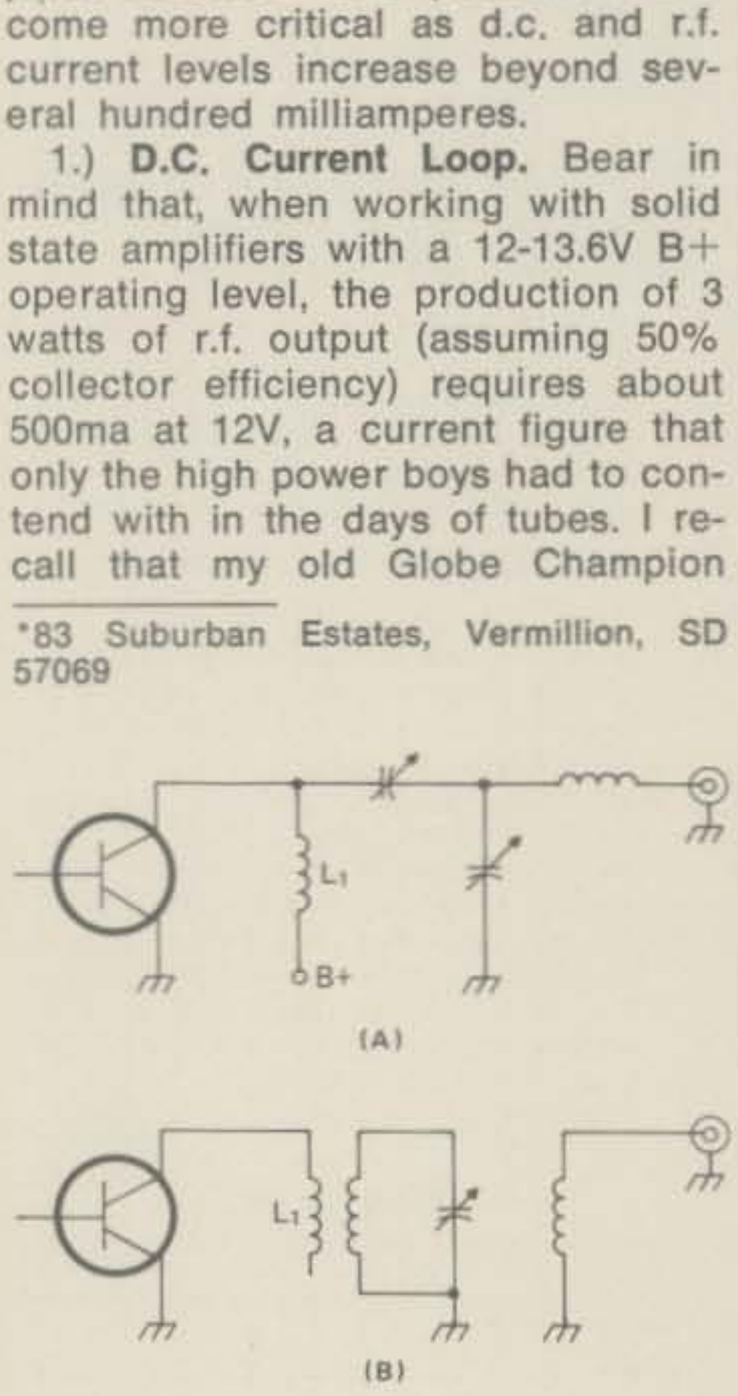

Fig. 1—Typical collector circuits incorporating a high d.c. current bearing inductance.

taken to eliminate resistances at any point in the major d.c. current loop.

2.) **R.F. Current Loop.** Both ohmic and reactive resistances are capable of introducing losses into a high level r.f. current circuit. Any component carrying the collector circuit r.f. current should represent as low a resistance as possible. Principal among these are collector inductance windings, r.f. bearing leads, and associated solder joints.

Inductance windings are the major source of r.f. current loss. For example, a #24 winding carrying about 5 watts will heat noticeably, indicating r.f. loss of a considerable amount which would otherwise reach the antenna. This point was made dramatically evident to me in experimenting with a multiband transmitter which used a 2N5589 final and an output tank circuit such as shown in fig. 1(B) on 80-40 meters. With the original inductance consisting of 34 turns of #24 on a T-68-2 core, maximum outputs were 4.2w (40m) and 4.8w (80m). An 18 turn winding of #18 on a T-106-2 core (about 1⅛th inch) was substituted, and outputs in excess of 6.2 watts were obtained on both bands. No heating in the inductance was evident, and a corresponding heat dissipation in the transistor was noted, indicating increased input as well as output. Both the wire sizes and length of wire used in the windings directly related to the output level. The important point is that the r.f. power that served only to heat the first inductance was then available for output to the antenna with the second inductance winding. High level r.f. inductances, then, should utilize wire sizes and lengths that minimize both d.c. and r.f. loss because of resistance.

The use of high Q components in high level r.f. circuits is also important in eliminating r.f. losses. With respect to matching and output network design, a low loaded Q should be sought because of its low circulating currents as compared to high Q networks, and, in addition, the low Q circuit will offer wider bandwidth. Shunt components in the collector circuit—chiefly shunt capacitors in a matching network—should exhibit low series resistance and low series inductive impedance resulting from either lead length or capacitor type. V.h.f./u.h.f. parasitics can be caused by an amazingly short lead length in critical low impedance circuits. For this reason, commercial designers have relied upon uncased micas and ceramic chips which have no leads at all (Union Carbide 1225 or 1813 types, or Varadyne 14 or 18 types) in developing high level p.c. board r.f. amplifiers.

Grounding is extremely important in obtaining stability and efficiency in r.f. amplfiers where very low impedances are encountered because of power levels and device characteristics, and attention to grounding matters cannot be sufficiently stressed. A low impedance ground return path in the major r.f. loop is essential. An advisable practice with respect to mounting power transistors with dual emitter strips is to solder the strips to the ground foil right at the transistor case, rather than somewhere out along the strips. If double-sided p.c. board is used (and it should be), the ground plane foil should be connected to the emitter strips directly by means of a soldered-thru hole, or #20 wire leads thru a hole in the board. Another consideration is the ground return path from base and collector matching networks when using dual emitter strip devices. These paths are usually at a very low impedance, and it is advisable to equalize current flow to the emitter strips by splitting any network shunt capacitance into two capacitors, one to each of the strips. Total inductive impedance resulting from capacitor leads is then minimized also.

The above points should help in eliminating losses in the high level r.f. current loop. Some of the problems mentioned in earlier columns, such as feedback from collector to base, or to previous stages, may be encountered because of the intensity of the r.f. field generated by current bearing leads and components. Assuming that r.f. isolation and d.c. decoupling is adequate, shielding and parts placement usually provide the solution. If feedback occurs between collector and base circuit of the high level amplifier,, a shield cut to fit across the transistor body and solder to the emitter strips will usually eliminate the difficulty. The lead carrying power from the driver to the final input is susceptible to r.f. pickup unless it is coax. Enclosing the final amplifier in a separate shielded compartment will further insure elimination of interstage feedback. If leads to switches and tuning capacitors bear high-level r.f. current, care must be taken to insure adequate isolation of such leads from the input side of the amplifier and prior stages. (To be continued in a later column)

(Continued on page 73)

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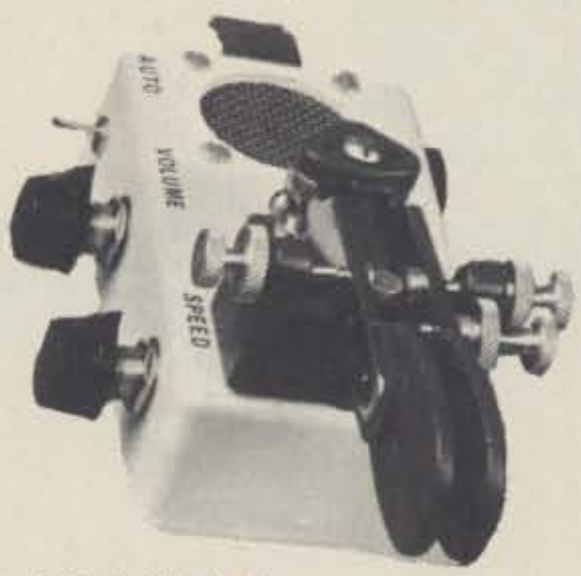

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Math's Notes

BY IRWIN MATH, WA2NDM

Last month, you will recall, we discussed the basic input and output schemes of a typical, low cost, calculator chip, the National Semiconductor MM5736.

This month, we will discuss various methods of interfacing this chip for non-calculator applications.

Since the MM5736 is normally controlled by push-buttons, the first obvious method to remotely put information into it is with a simple s.p.s.t. normally open relay. For this method, low cost reed relays are ideal. A typical example of the use of relays with this chip is the event counter shown in fig. 1. This circuit is suitable for a wide range of counting applications such as repeater usage, people counting, item counting on a conveyor belt, auto's passing a particular point, etc. It makes use of the so-called "autosumming" feature of the MM5736. Briefly "autosumming" is the ability of a calculator chip to repeatedly add an initially entered number by repeated pressing of the "+" key.

In fig. 1, to operate the counter, the reset switch is first pressed causing the display to read "O". Then the start switch is pressed entering "1" into the chip and causing the display to indicate "1". The counter has not counted one event at this point however. It is just an idiosyncracy of the chip. Now, when the count switch is activated, the reed relay will in turn also be activated and will enter a "+" into the chip causing the display to still indicate "1". The next activation will display "2" and so on until "999999" is reached.

Such a counter will count at a maximum speed of 40-150 counts per second depending on the characteristics of the particular MM5736 being used.

To make this unit an up-down (bi-directional) counter, one only needs to connect another relay between pins 3 and 16 of the MM5736. This relay will gate the "−" input and the counter will count down until "−999999" is reached.

To fully realize the power of this circuit one should note that to do the same job with standard TTL logic would require 6 up-down counter chips, one or two additional DIP packages for proper logic steering and 6 decoder/driven chips for a total of 13-14 chips. One other feature of figure 1. To count by numbers other than 1, you simply arrange the start button so that the initial entered number is the number you wish to count by.

If speeds in excess of the 40-150 counts per second are desired, the simple additional circuitry of fig. 2 must be added to the basic circuit. This will double the effective counting speed of the circuit at the expense of 1 diode and an inexpensive SN74C00 CMOS chip. This circuit operates by reducing the noise immunity feature within the chip and thereby effectively doubling the speed

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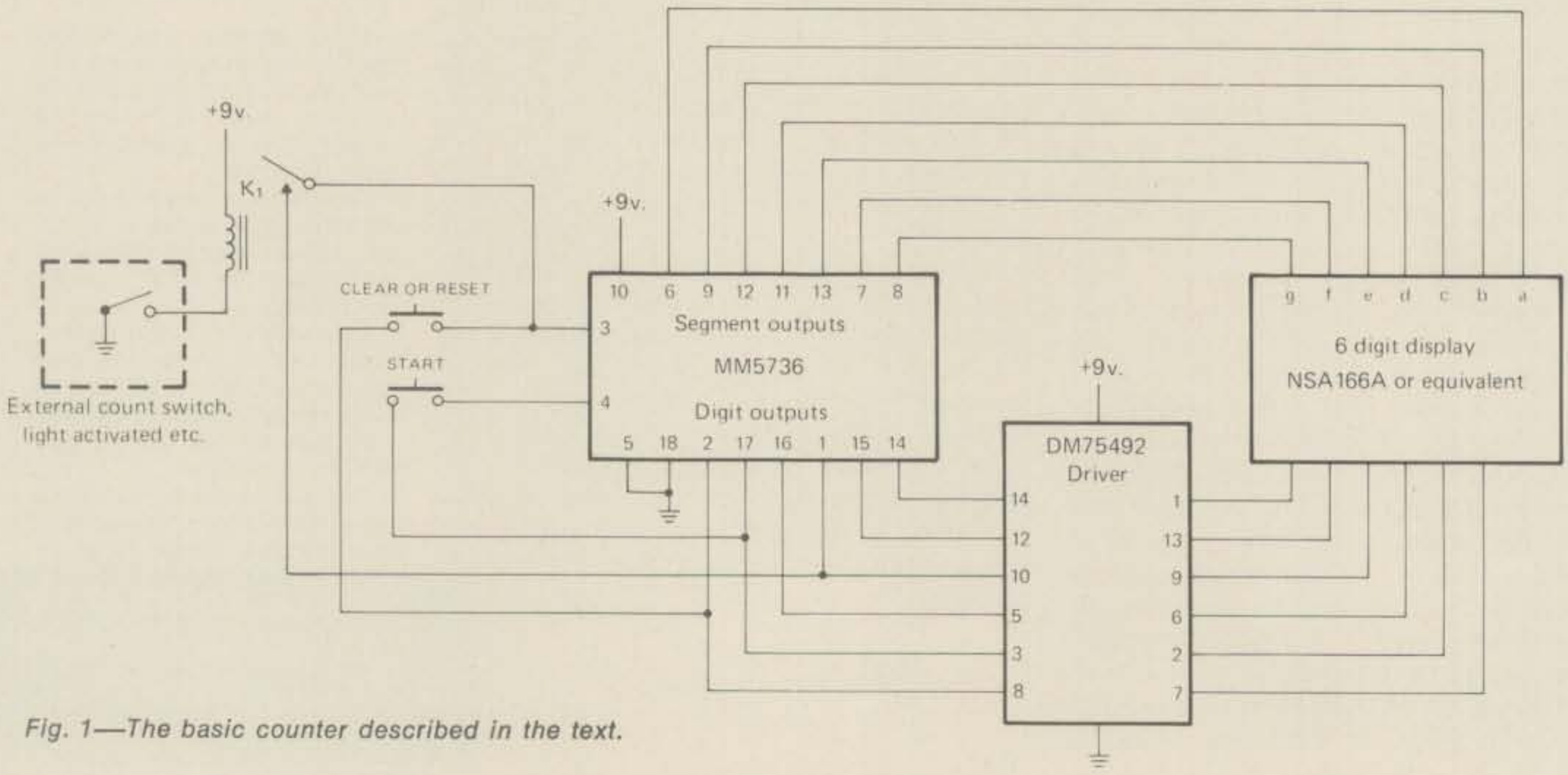
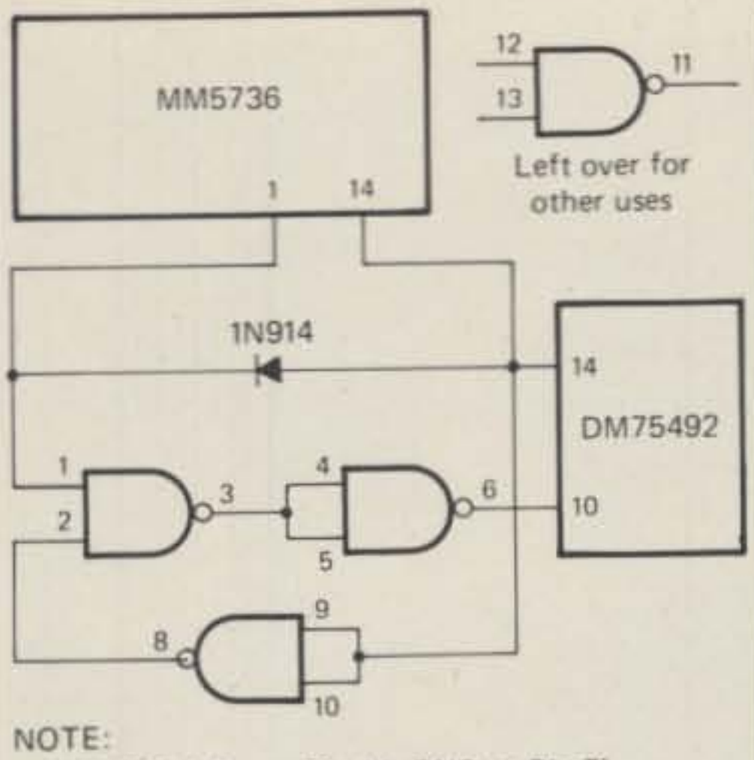


Fig. 1—The basic counter described in the text.



NOTE:
SN74C00 (+9v. to Pin 14, GND to Pin 7)

Fig 2—A speed up circuit using a SN74C00 DIP. All other connections are the same.

of operation. Adequate noise immunity still remains for just about all applications however. In addition to relays, the calculator chip may also be interfaced by logic elements. Fig. 3 shows one basic method. Here ¼ of a CMOS two-input and gate is employed as a switch to gate the clear signal into the MM5736. When the control input is made high, a high pulse from pin 2 will cause the output of the gate to also go high, effectively passing the signal to the chip. When the control input is low, the output of the gate will also be low and signals will not pass through. This same method may also be used to gate other functions or numbers into the chip.

In fig. 4, we have an example of the above. Bipolar transistors and CMOS gates have been combined to form a useful timer circuit that will count up to 99999.9 seconds with a resolution of .1 second. The circuit also makes a useful electronic "stopwatch" if so desired.

Operation is as follows:

Inverters b, c and d form a 10 Hz oscillator which is used as a time base for the circuit. A 100K potentiometer is provided to set the oscillator at exactly 10Hz. The output of this oscillator is fed to one input of a 3 input hand gate, f, which in turn drives a pnp transistor used to feed the "+" signal into the calculator. In order to have an output from gate f and the transistor, all inputs to f must be high. As shown in the diagram the pin 3 input of f is low, so no "+" signals are passed.

Inverter a, gate e and another pnp transistor are employed to produce an automatic start feature for this timer. Remember, we must first enter a "1" in order to count properly. Now when the count button is pressed, the voltage at pin 9 of a immediately goes high. This causes the output of a to go low and until

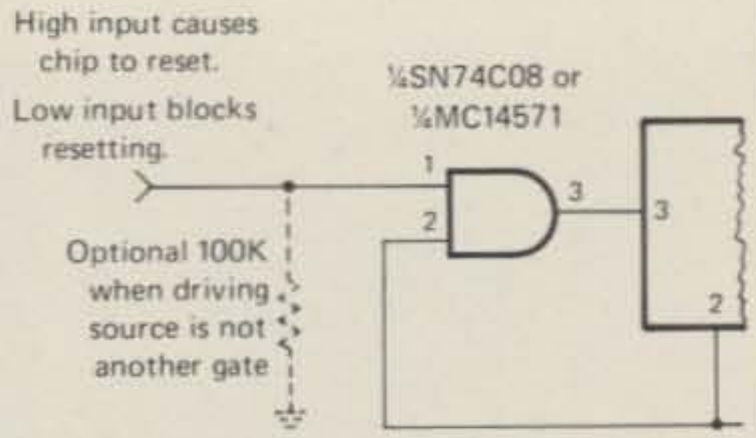
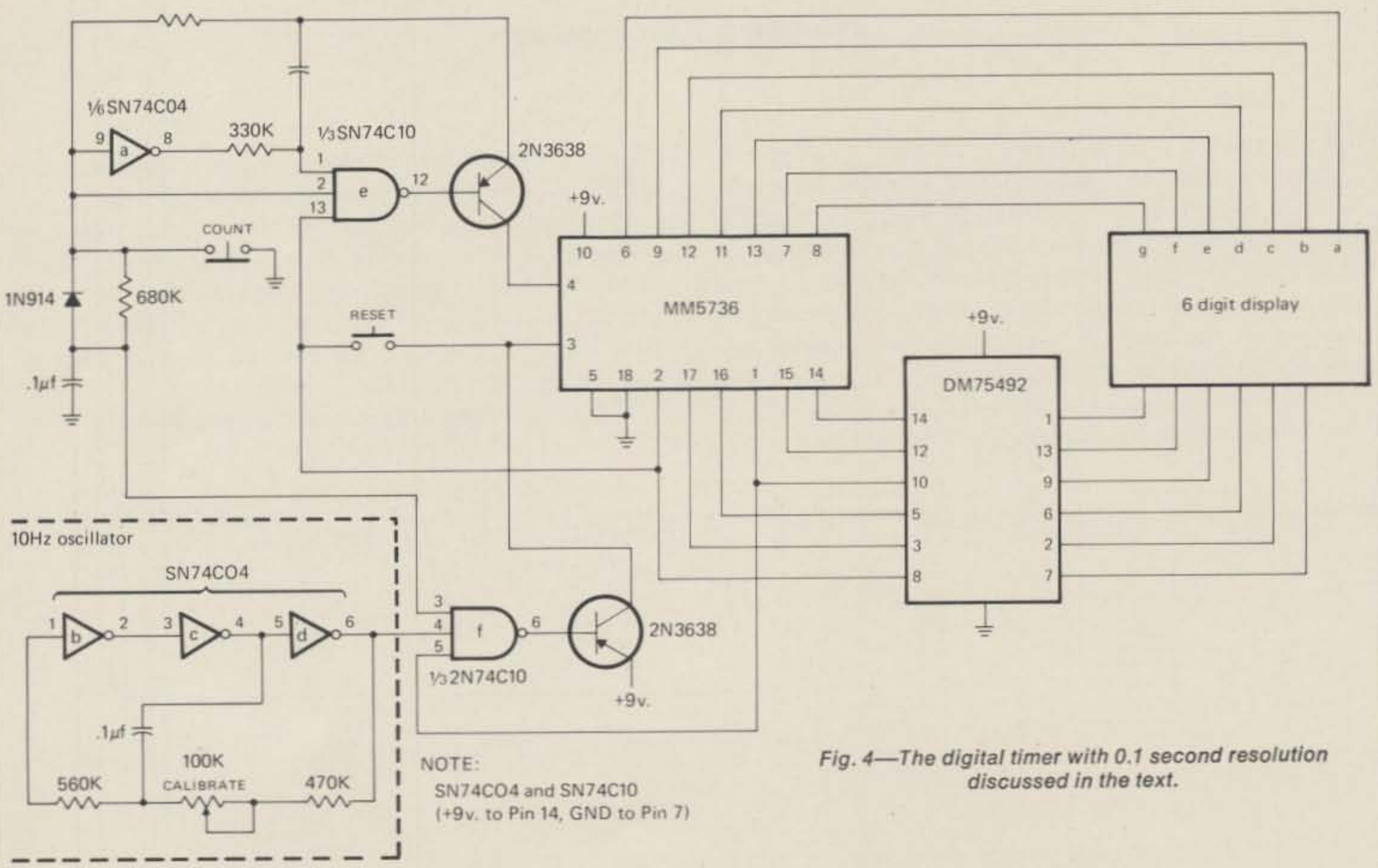


Fig. 3—Using a CMOS Gate to control the calculator chip.

the .1 μF capacitor connected to pin 1 of e discharges, gate e is in a position to allow a "1" signal to pass into the counter chip. As soon as this happens the .1 fully discharges and e cuts off.

In a similar manner another .1 μF capacitor was charging at a slower rate through the 680K resistor connected to the count button. The charging time for this capacitor was chosen such that it would fully charge after the 330K—.1 combination discharged. Now gate f is activated and the oscillator signals begin to trigger the calculator and the circuit displays time in tenths of a second. When the count button is released the .1 μF discharges quickly through the diode shunting the 680K

(Continued on page 72)



NOTE:
SN74CO4 and SN74C10
(+9v. to Pin 14, GND to Pin 7)

Fig. 4—The digital timer with 0.1 second resolution discussed in the text.

The MR-2 is small enough to fit in a short pocket. All controls and jacks are clearly marked and are on top.

CQ Reviews: The Tempo MR-2 VHF Monitor Receiver

BY HUGH R. PAUL*, W6POK

On a recent visit to Henry Radio in Los Angeles, I came across the Tempo MR-2 monitor receiver. This little unit is a low cost ($79.00) 12 channel crystal controlled receiver that is small enough to fit in a shirt pocket. The receiver covers any 4 MHz segment in the 140-170 MHz range, depending on crystals. Included in the price of the receiver are four Ni-Cad batteries, charger unit, ear phone that disables the built in speaker when plugged in and a plug in, quarter wave wire antenna.

Employing 20 transistors, the receiver is dual conversion with a first i.f. of 10.7 MHz and a second i.f. of 455 kHz. Selectivity is enhanced by the use of two Murata dual section crystal filters in the 10.7 MHz i.f. and a four section Murata ceramic filter in the 455 KHz i.f.

A considerable amount of the receive gain is de-

(Continued on page 74)

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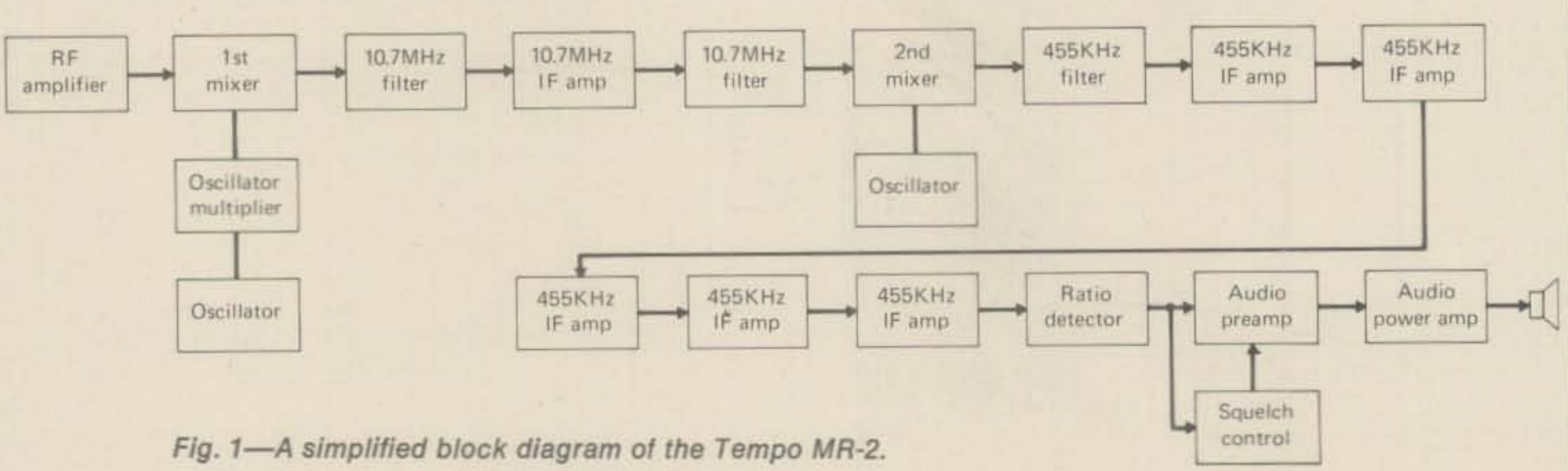

Fig. 1—A simplified block diagram of the Tempo MR-2.

Like Surplus? Want to get some gear going that didn't travel up San Juan Hill with "Teddy"? Read on.

Modern Surplus Equipment For 10 And 6 Meters

BY W. H. CRAIG,* WB4FPK

Every so often, a usable piece of surplus equipment seems to be ignored by amateurs, probably due to stories often heard of the difficulties involved in converting most military gear to amateur use, or due to unusual power supply requirements, etc. Another drawback is appearance. The units I'm about to describe are probably the most ugly I've seen in some years, primarily due to the rather clumsy, albeit sturdy channel selector knobs (fig. 1) which fortunately can be replaced with a little effort (fig. 2). The equipment I'm about to describe is of modern vintage and can be connected up and be operating in a half-hour or so, on 110 v.a.c.

These units are the RT-67 and RT-68 f.m. transceivers which cover 27-39.9 MHz and 38-54.9 MHz, respectively. (There is a third member of this "family"—the RT-66—which covers 20-27.9 MHz, but is

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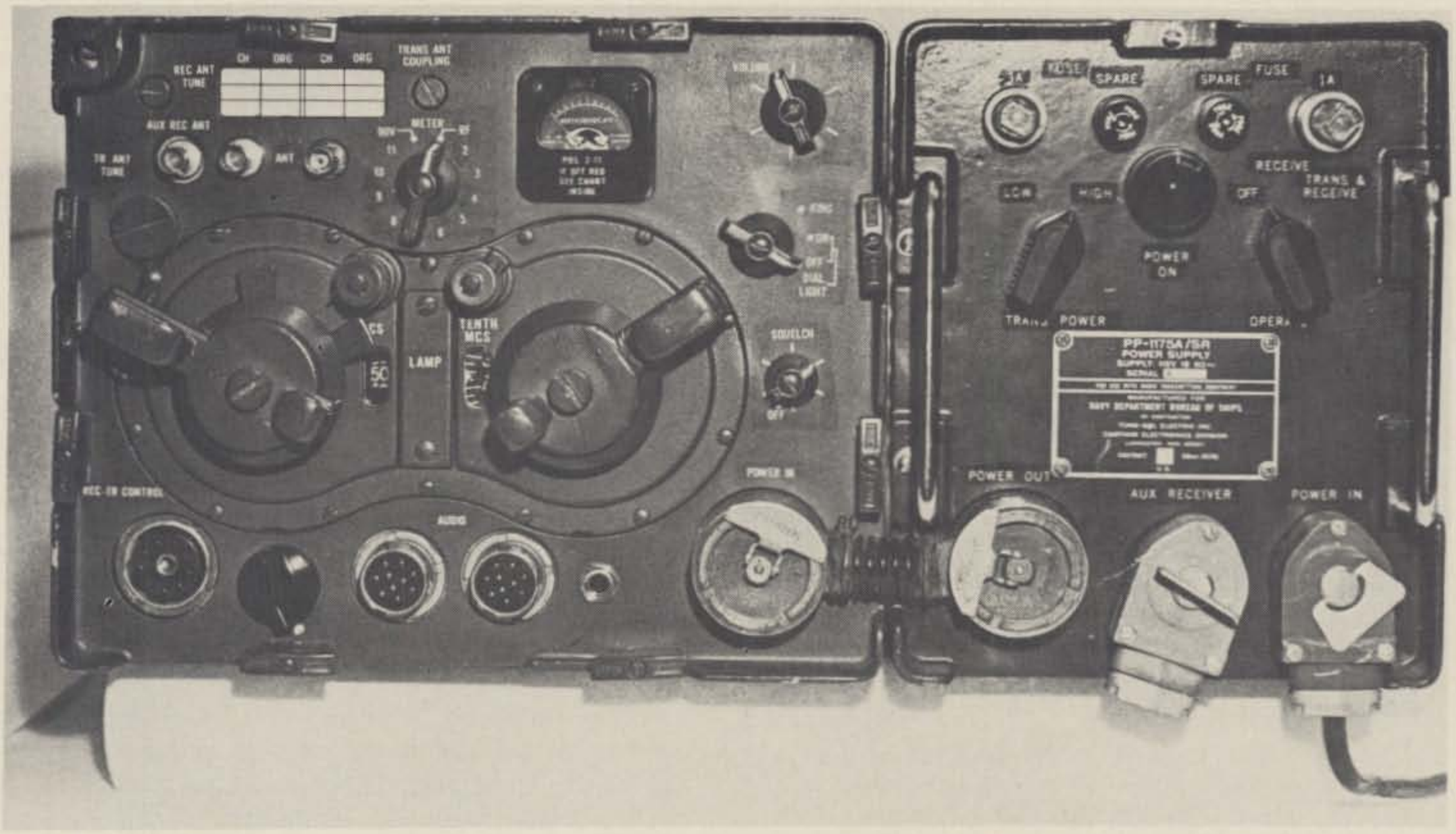

Fig. 1—"Front panel view of transceiver and power supply, showing the CX-1211/U power cable assembly."

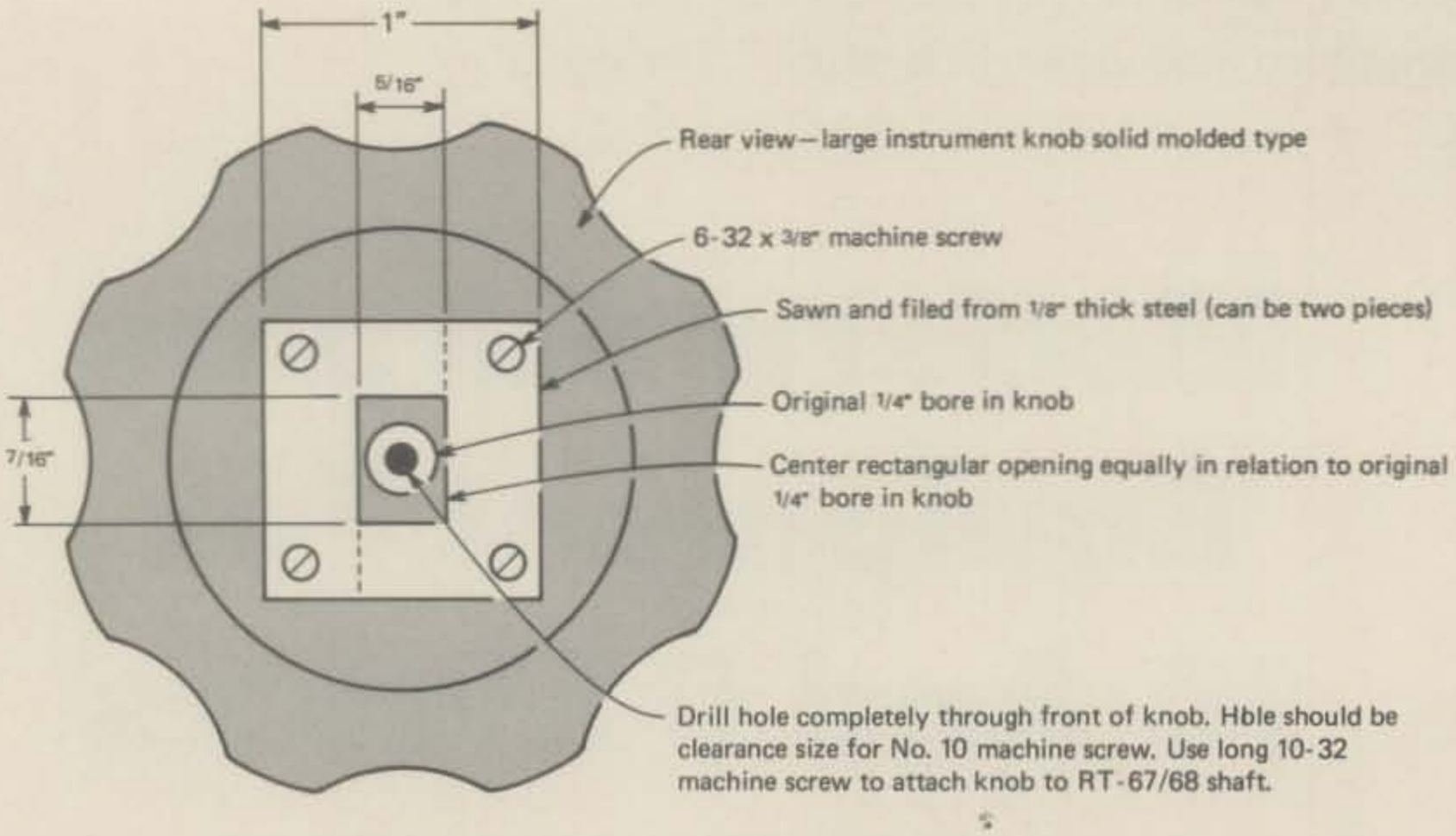
1"
5/16"
7/16"
Rear view—large instrument knob solid molded type
6-32 x 3/8" machine screw
Sawn and filed from 1/8" thick steel (can be two pieces)
Original 1/4" bore in knob
Center rectangular opening equally in relation to original 1/4" bore in knob
Drill hole completely through front of knob. Hble should be clearance size for No. 10 machine screw. Use long 10-32 machine screw to attach knob to RT-67/68 shaft.

Fig. 2—Drawing showing a method of attaching different knobs.

not usable on amateur frequencies in this range as there are no wide band F3 allocations for amateur use here.) These units are parts of military radio sets such as AN/GRC-3, 4, 5, 6, 7, & 8 or AN/VRC-13, 14, 15 etc. Much of these "sets" are of little use to the amateur as they were designed for rugged vehicle mounting and tend to increase the wiring complexity due to remote control boxes, battery boxes, hand cranked generators, line audio amplifiers, etc., all mounted on a shockmount base which weighs approximately 60 pounds by itself! The items that are of interest for amateur use are: RT-67 or RT-68 transceivers; LS-166/U Loudspeaker; M-29/U P-T-T Microphone; CX-1211/U Power cable assembly; and PP-1175A/SR 110 v.a.c. input power supply (Navy type). Of less interest, but mentioned here as the Navy supply is provided with power output jack for them, are the auxiliary receivers, R-109 and R-110, covering 27-39 MHz and 38-55 MHz respectively. These units would allow the operator to monitor the national calling frequencies or a local net frequency while operating in another portion of the band. These receivers are continuous tuning across their coverage range or can be detented to specific frequencies for netting purposes. The receivers and transmitters of the "RT-" sets are detented in 1 MHz steps (left-hand tuning knob) and either continuous tuned or detented at 0.1 MHz steps over each 1 MHz segment with the right-hand tuning knob. (The detent is engaged by turning the knob to its extreme clockwise position, and disengaged by turning it to its extreme counter-clockwise position.)

The receiver is rated as having a sensitivity of 30 db signal-plus-noise to noise ratio with a 0.5 Microvolt input signal. The bandwidth is specified as approximately 80 kHz at 6 db down. Audio output is approximately 1 watt at the speaker, 50 mw at the "Phone" output, and 30 mw. at a constant fixed level output intended to drive an interphone amplifier. The front panel controls are quite conventional, with volume, squelch, and tuning controls plainly marked. The transmitter r.f. output is rated as 16-18 watts in "High Power" and 2 watts in "Low Power." (The power supplies have a front panel switch to set the power level.) The receiver is a conventional dual conversion superhet, having a 1st (tunable) i.f. frequency of 4.45-5.45 MHz, and a 2nd (fixed) i.f. frequency of 1.4 MHz. The first conversion oscillator is crystal controlled on any of 17 steps in the RT-68 and 12 steps in the RT-67, and the crystal selection is accomplished via the 1 MHz channel knob on the front panel. This same control is geared to variable capacitors that set the coarse L/C ratios of all tuned stages. The v.f.o., which supplies injection to the 2nd mixer, is controlled by the 0.1 MHz tuning control. This control is also geared to the left hand controls' variable capacitors, and provides the fine adjustment of the L/C ratios in the various tuned stages.

The transmitter is a bit different than is usually found in this type of equipment. No frequency multiplication is used, the output frequency being produced by hetrodyning. This transmitter uses direct f.m. generation, provided by "push-push" reactance modulators which are coupled to the transmitter v.f.o. The transmitter v.f.o. is mechanically linked to the receiver v.f.o., but to insure that the output frequency will be on the same frequency as the receiver is tuned to, the receiver i.f. (1st and 2nd) is used as a "frequency monitor" (it samples the output of the transmitter v.f.o. and the receiver v.f.o. becomes the "frequency standard." If the transmitter is not on the correct frequency (meaning the

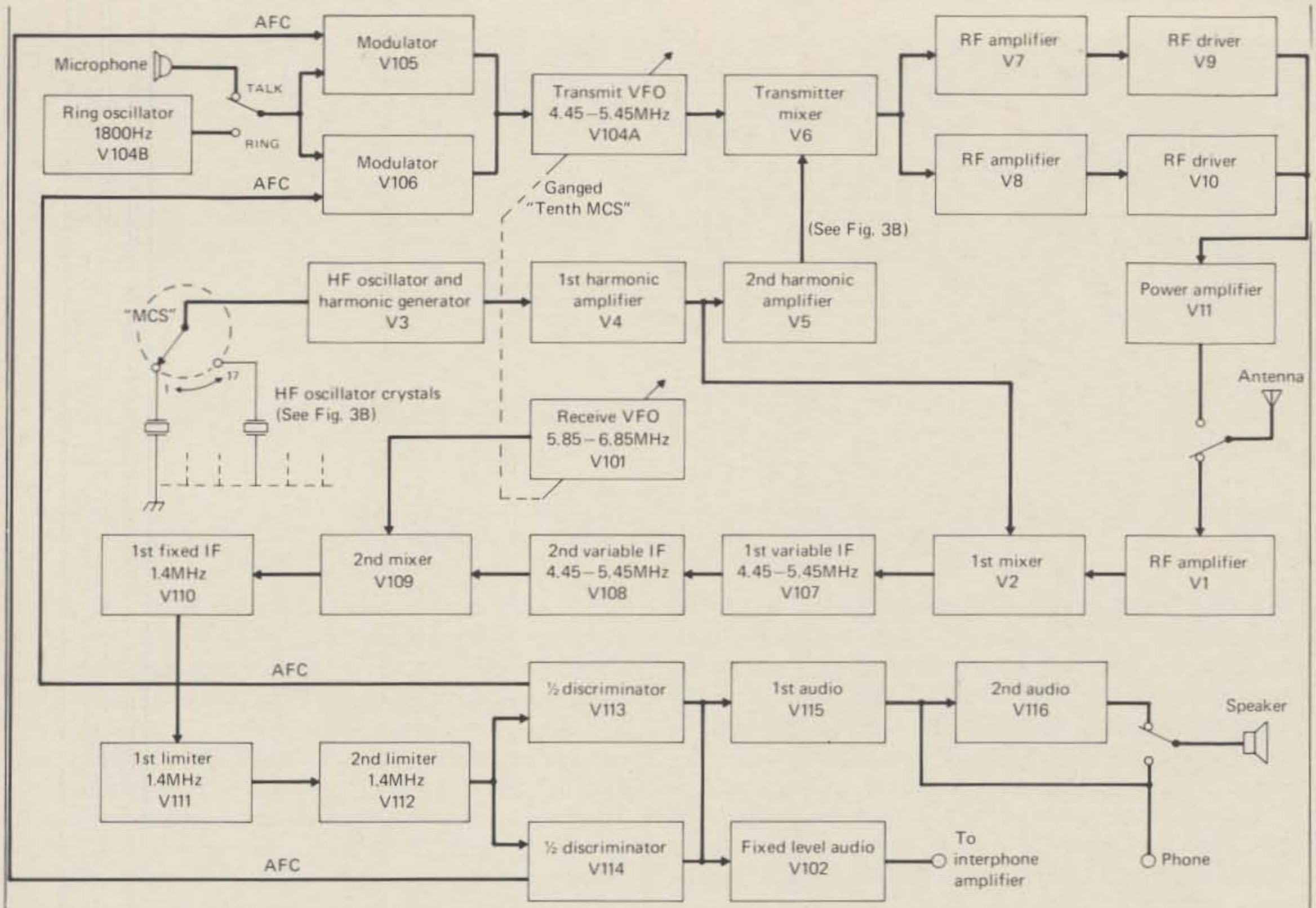

Fig. 3(A) Block diagram of the transceiver.

same frequency as the receiver), a d.c. error voltage is produced at the receivers' discriminator. This d.c. error voltage is coupled back to the transmitters' reactance modulators, which shifts the transmitter frequency the required amount. This nicely eliminates tracking problems that would occur with a simple mechanical system. At this point, the output of the transmitter v.f.o. is mixed with the output of the receiver h.f. (1st conversion) oscillator to produce the output frequency. (See figs. 3A and 3B for a block diagram of this system.)

All tubes used in the transmitter and receiver are 1.4 volt or 3.0 volt filament types (either 7 or 9 pin miniature types) except for the final amplifier which is a 2E24 (6 volt directly heated filament) and the receivers r.f. amplifier stage which uses a 6AK5. The tubes are wired in strings of 6 volts and all 6 volt strings are in parallel. The transmitter filaments are keyed on and off with the P-T-T circuit. All tubes in the transmitter are of the "instant heating" types and r.f. output occurs about 1-2 seconds after pressing the P-T-T button on the mike. A meter on the front panel is provided to check on the various internal voltages, and will indicate if a filament is open, whether the plate voltage for the receiver is present, and also indicates (via a r.f. voltmeter circuit) if there is any r.f. output.

Directly above the meter switch is the **Trans Ant Coupling** control. This is a multiturn fine load con-

1st Conversion Oscillator crystal Frequencies. (And harmonic amplifier outputs)

	RT-67			RT-68		
Crystal Pos.	Crystal Freq. kHz	Mult.	Output Freq. MHz	Crystal Freq. kHz	Mult.	Output Freq. MHz
1	none	—	—	8387.500	×4	33.550
2	7516.666	×3	22.550	8637.500	×4	34.550
3	7850.000	×3	23.550	8887.500	×4	35.550
4	8183.333	×3	24.550	6091.666	×6	36.550
5	8516.666	×3	25.550	6258.333	×6	37.550
6	8850.000	×3	26.550	6425.000	×6	38.550
7	6887.500	×4	27.550	6591.666	×6	39.550
8	none	—	—	6758.333	×6	40.550
9	7137.500	×4	28.550	6925.000	×6	41.550
10	7387.500	×4	29.550	7091.666	×6	42.550
11	7637.500	×4	30.550	7258.333	×6	43.550
12	7887.500	×4	31.550	7425.000	×6	44.550
13	8137.500	×4	32.550	7591.666	×6	45.550
14	8387.500	×4	33.550	7758.333	×6	46.550
15	none	—	—	7925.000	×6	47.550
16	none	—	—	8091.666	×6	48.550
17	none	—	—	8258.333	×6	49.550

Fig. 3(B)—Table of crystal frequencies and multiplier output frequencies of the H.F. oscillator.

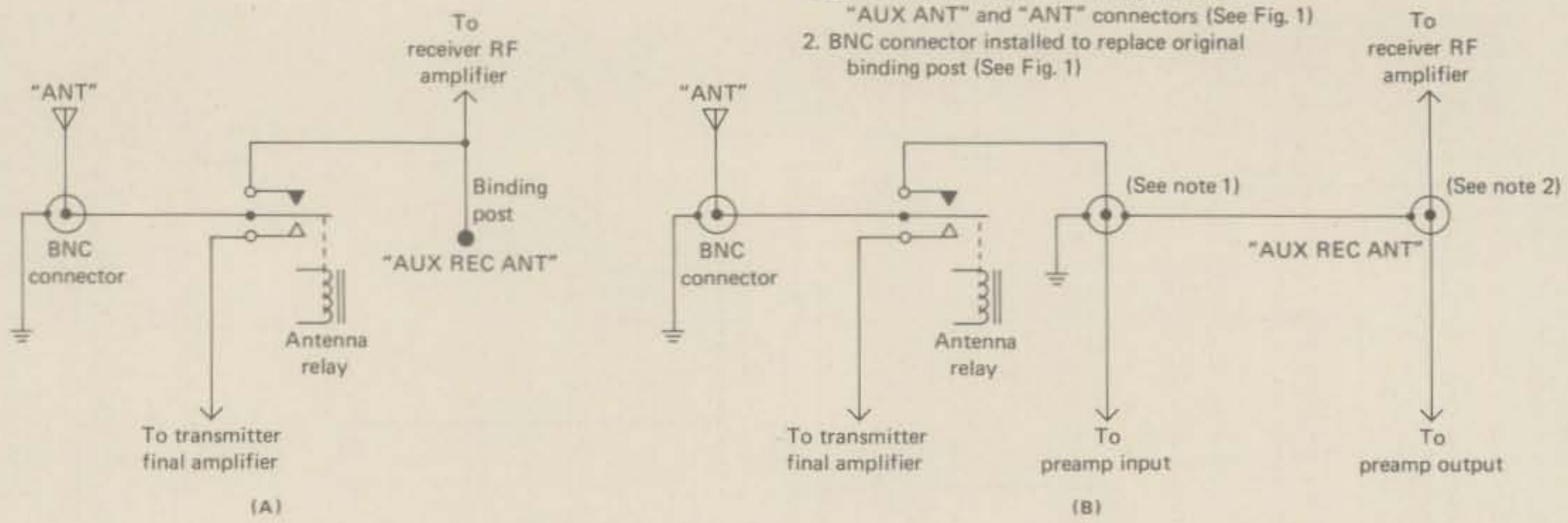

Fig. 4(A)—Wiring diagram of original antenna changeover hook-up. (B)—Suggested alterations to antenna changeover hook-up to permit installation of an external pre-amplifier.

trol and is adjusted for the segment of the band being tuned. At the upper left hand side of the front panel is the **Rec Ant Tune** control which is a multiturn control adjustment to match the antenna to the receiver r.f. stage. About 2 inches below this adjustment is the **TR Ant Tune.** This adjustment is provided with a spring-loaded socket wrench with a screwdriver slot on the operator end for adjustment. WARNING: THE 10th MHz TUNING CONTROL MUST BE IN THE ZERO POSITION WHEN ADJUSTING THIS CONTROL IN EACH OF THE 1 MHz POSITIONS. SERIOUS DAMAGE TO THE TUNING MECHANISM WILL OCCUR IF THIS IS NOT OBSERVED. The adjustment is started at the lowest frequency. There is one adjustment screw for each channel position. Pushing in on the screwdriver engages the socket wrench with each of the appropriate adjustment screws. (Be sure it pops back out before attempting to turn the channel knob to the next position so as not to damage the mechanism.) These adjustments are made in conjunction with the adjustment of the coupling control (they are somewhat interacting) for highest output power concurrent with plate current resonance (dip). The plate current can be read at one internal test point. On top of the transmitter chassis near the front panel, will be noted an empty dual crystal holder socket, the terminals of which will be marked E-9F, E-9G, E-9H and E-9J. The first two are used to measure the grid drive to the final amplifier. Connect the negative lead of a 0-10 volt multimeter to E-9F and the positive lead to E-9G. What you are measuring is the voltage drop across a 1K resistor which is in series with the grid return lead. Hence, 10 volts = 10 Ma. The bias voltage can be measured between E-9G and chassis ground. (This is nominally —27 volts.) Plate current is measured at the other two connections. Connect a 0-2.5 volt multimeter with the positive lead to E-9J and the negative lead to E-9H. A 20 ohm resistor is in series at this point with the plate supply lead of the final amplifier stage, hence 1.0 volts = 50 Ma. Plate supply voltage can be measured between E-9J and chassis ground and is typically in excess of 450 volts. Typical plate current is 75 ma (1.5 volts on the multimeter) and grid current is 2.5 ma. (2.5 volts on the multimeter.). The receiver chassis has an octal socket test point. Pin 1 is ground, pin 2 is discriminator level (center-tap of the discriminator secondary), pin 3 is 1st limiter grid, pin 4 is 2nd mixer cathode, pin 5 is 2nd limiter grid, pin 6 is discriminator zero (cathode of one of the diodes), pin 7 is the same as pin 6 but attenuated 12 db, and pin 8 is the 2nd mixer grid.

A technical manual appropriate to this equipment should be obtained before attempting to make any changes to any of the internal adjustments. TM 11-291 contains the schematics for these units, the mike, speaker and d.c. power supplies etc. TM 11-284 has these schematics in addition to schematics for the auxiliary receivers and the low power transceivers used with some of these "radio sets".

Hookup is quite simple if you have all the appropriate connectors. The mike and speaker can be connected to either of the two connectors at the bottom center of the panel marked Audio. Connections are duplicated on each. They are: (connectors J-310 & J-311)

"A" = Phones	"F" = Transmit control (P-T-T)
"B" = Ground	"H" = Ground
"C" = Mike (in)	"J" = N.C.
"D" = N.C.	"K" = N.C.
"E" = Ground	"L" = Speaker

The speaker case contains a line to voice coil matching transformer, and a switch to connect this to the "Phones" lead for reduced audio output. The speaker itself is a high quality audio driver unit which is moisture proof. The reason the speaker can be switched to the output of the first audio stage

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was to permit reduced current consumption when operating from a battery pack. The wiring of the battery pack power cable automatically disconnects the power supply from the 2nd audio stage plate lead. When using the direct hook-up as shown in fig. 1, the Navy power supply will provide this connection. The power supply jack connections are as follows: (J-309)

"A" = +5.6 volts for relays
"B" = +85 volts
"C" = +150 volts
"D" = Ground
"E" = Ground
"F" = +250 volts
"H" = Ext. Rly. (return)
"J" = +85 V Ext. Rly. (return)
"K" = Power control
"L" = +6.3 v Rec. Fils.
"M" = +105 V 2nd Audio Plate
"N" = +6.3 V Trans. Fils.
"P" = +450 volts
"R" = −27 volts

(terminals H and J are jumped together at the power supply to provide plate voltage to the first audio stage.)

The jack in the lower left hand corner of the front panel marked **Rec-TR Control** was used for remote control of the unit. Its connections duplicate many of those on the audio jacks and are as follows: (J-312)

"A" = Speaker
"B" = Fixed level audio output
"C" = Mike (in)
"D" = Ground
"E" = Phone
"F" = Speaker
"H" = Ext. Rly. (return)
"J" = +85 V Ext. Rly.
"K" = Transmit Control

To use the Navy power supply with this direct hook-up, one very simple change must be made at the power supply power output jack. Remove the power supply from its cabinet, and turn it upside-down. Unsolder the (probably yellow) lead going to pin "H" and tuck it out of the way under the wiring harness. (There is no power on this lead so it's not necessary to insulate it.) Next, solder a short bare jumper wire between terminal "H" and terminal "J". ("J" is right next to "H" but one row inward.) The power supply can now be connected to the transceiver and tested. The a.c. power input connections are: 110 v.a.c. to terminals "B" & "C"; terminals "A" & "D" are N.C. but could be used to provide a point for grounding by adding an internal jumper from these terminals to chassis ground. The auxiliary receiver jack has the following connections: "A" = +6.3 Volts; "B" = N.C.; "C" = Ground; "D" = +135V. The 6.3 Volt point should be checked at once for proper output voltage. This can most conveniently be done at the Aux receiver jack. This section of the power supply is electronically regulated, and a tap on a 10 watt wirewound resistor at the upper rear of the supply can be moved to adjust the output voltage. DO NOT MAKE THIS ADJUSTMENT WITH THE SUPPLY TURNED ON. Incidentally, there is a very nice plastic schematic diagram

Fig. 5—"M-29/U Microphone and LS-166/U Loudspeaker."

of the complete power supply cemented to the power supply chassis, so you probably won't need the TM for this unit, but it is available. The filter capacitors in this supply are of the twist-lock types. However, they are mounted in plug-in sockets so they are quite easy to change. There's one catch however: the cans of these capacitors are insulated from the capacitor, and the negative lead is brought out through an extra terminal, unlike the run-of-the-mill TVL types, and probably would be quite difficult to obtain replacements for. However, the sockets are equipped with contacts to connect to the can of the capacitors. Therefore, you can with a very minor amount of rewiring adapt them to use the conventional TVL types. One of the brand new supplies of this type that I purchased didn't have proper output voltage from the HV section, and had a nearly open capacitor. I found it a very simple modification to rewire the socket for a locally available TVL type capacitor. This supply uses a voltage-quadrupler (it's all solid-state by the way, with the exception of two voltage regulator tubes) circuit and will not produce normal output voltages if any of the capacitors have opened or changed drastically in value.

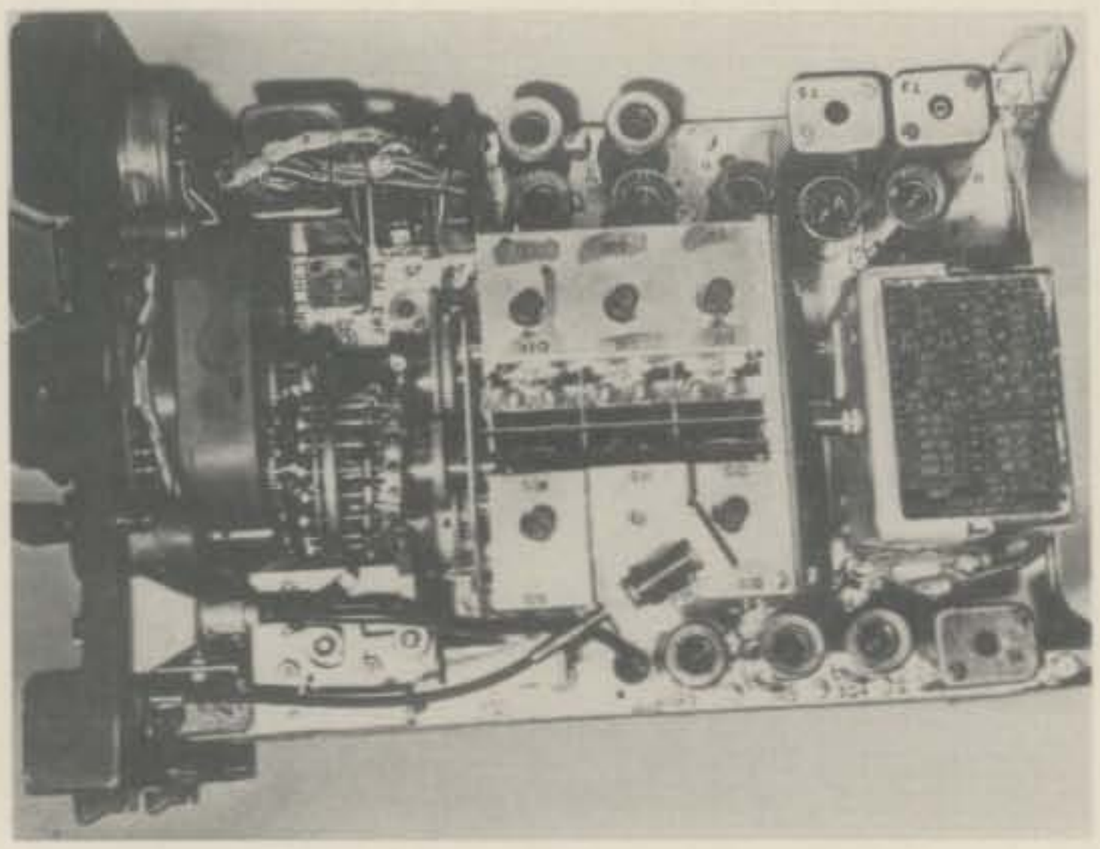


Fig. 6—"Transceiver removed from cabinet, left side (transmitter and receiver r.f. stages). The final amplifier test jack (J3) is plainly visible near the lower right-hand corner of the chassis. The drum of adjustment screws that can be moved with the 'TR ANT TUNE' control (see text) are directly above J3. The crystals for the h.f. oscillator are beneath the cover bearing the trouble-shooting chart at the extreme left center. Meter switch positions 7-11 only read when the P-T-T button is depressed. The chart tells which filament is open if the meter doesn't read near center scale.

There are several unmarked controls shown in the photo (fig. 1) that have been added by the author. The black knob at the bottom left hand side is a gain control for the carbon mike. It's simply a 300 Ohm potentiometer wired in series with the main mike lead from all of the audio jacks before it goes to the transmitter strip. Another addition was a jack (phone jack) at the lower right hand side. This is a audio line input (approx. 600 ohms), and simply wired to a winding on the microphone transformer that is used to provide an input point for the 1600 Hz ring oscillator that is controlled by the control marked "Ring-Dial light off—Dial light on" knob. In the upper left hand corner, the original Aux antenna binding post has been replaced by a BNC connector. (The original hole can simply be reamed out or drilled out to ⅜" diameter and the BNC connector installed. The front panel is cast aluminum so its quite easy to work with.) The "extra" BNC connector shown between the previously mentioned two was installed so that an external pre-amp could be added to the receiver input path, since there was not sufficient room inside the cabinet proper to accommodate one. This "extra" connector is actually the output from the antenna change-over relay. The actual input to the receiver front end is made through the BNC connector marked **Aux Rec.** The external preamp is then obviously connected between these two connectors. (It's possible to do all this drilling without removing the chassis, but some precaution should be made to prevent shavings of metal from getting into the wiring etc. The simplest way I've found of doing this is to cover the area where the drill will break through with masking tape, whose sticky side will trap the chips.) Fig. 4A and 4B show the wiring before and after altering the antenna circuits.

As I mentioned earlier, the original knobs can be replaced with something a little better looking if desired. The original knobs are held in place with long bolts through the centers of the knobs. Removing these bolts will allow the knobs and detents stops arms to be removed. As shown, the rear of a large solid control knob is drilled and tapped for some screws to mount a piece of ⅛" thick steel to it. The spacing between these two pieces of steel should be the same as the diameter of the flats on

the end of the shaft where it protrudes from the panel. A hole is drilled through the center of these knobs and the knobs attached to the shafts with long bolts. The stop arm posts can also be removed from the front panel as well. However, the original knobs do have the advantage of being set to the band limits which might prevent you from operating in the "wrong places". The overall operation of these units has been quite satisfactory. The frequency stability has been very good—drift is typically less than 500 Hz— and if carefully aligned, can be set to within a kHz of two by the dial! Since most of the equipment being used by amateurs is wide band, this isn't enough error to cause any distortion at the receiving end. However, with narrow band contacts, the gain control must be turned down to reduce the deviation, and if a frequency counter is available in the shack it should be used to adjust the output frequency as closely as possible to the desired operating frequency. Receiver sensitivity on 10 meters is good enough to not require a preamp. The six meter rig however is helped quite a bit as the atmospheric noise is considerably less at this frequency and does not present any limiting in this regard. Using a 6 element wide spaced beam on 6 meters, reports of full quieting from the west coast and midwest are the usual order of the day when the band is "open". On 10 Meters, a two element quad brings similar reports.

All of the equipment(s) mentioned in this article are available from many surplus dealers, such as Fair Radio Sales in Lima, Ohio (who, as far as I know, is the only dealer with the a.c. power supplies) and John Henderson surplus Sales in Germantown, Ky. who had a great number of these units and all the accessories the last time I was there. If you can go and pick out the particular unit you want you will probably be able to find many that look nearly brand new. (Incidentally, the a.c. supplies from Fair Radio were brand spanking new! And worth every penny asked for them even if you don't use them for this unit. They could be adapted to many other uses, and are built like a piece of laboratory quality equipment.) There is a 12 v.d.c. power supply available for these probably, but I've not been able to find any of them. It would be identified as a PP-109. There are plenty of the 24 volt supplies available, however there is no way they can be converted to use on any other voltage without a source of spare parts from the 12 volt supplies. The alterations required are extensive—transformers for example must be replaced—and is not recommended. However, if you have a good source of 24 v.d.c. available in the shack they are a good buy then. This unit is identified as the PP-112.

Considering the fact that the unit does not require the purchase of channel crystals the higher than average price for this equipment begins to

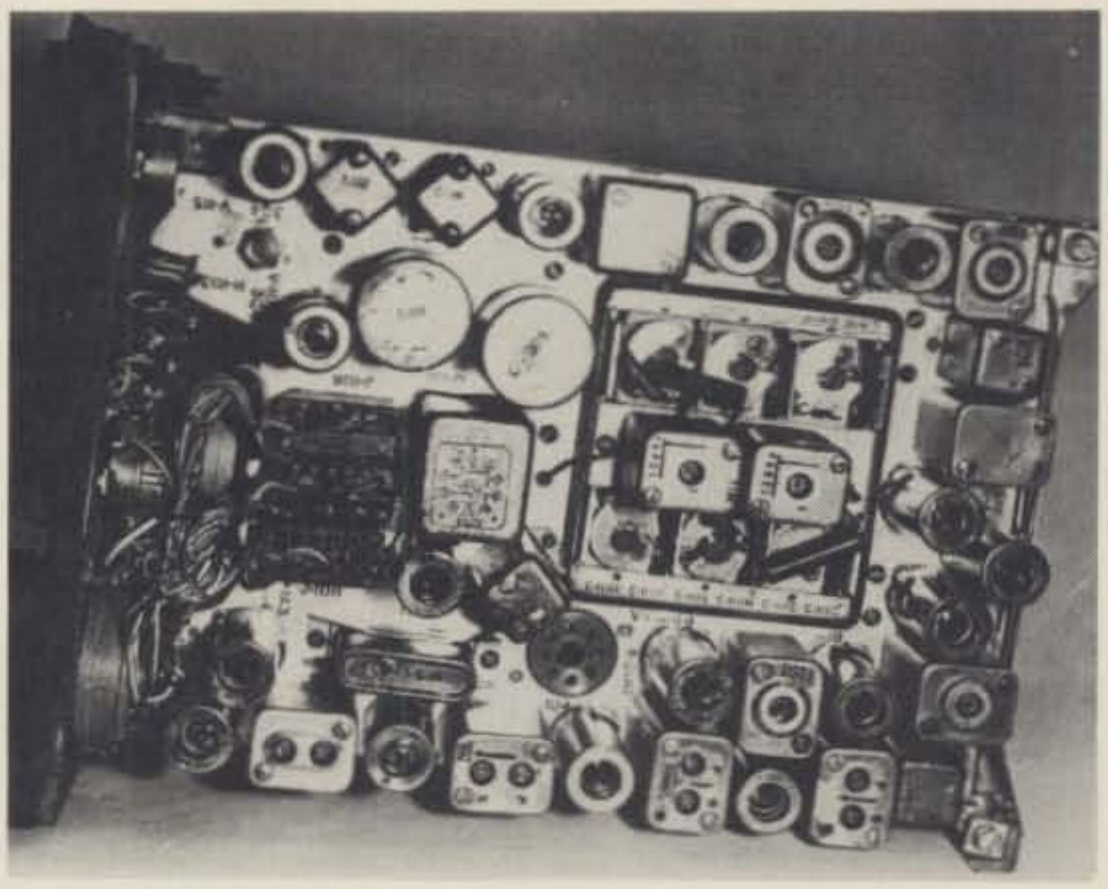


Fig. 7—Right side of unit—(receiver—except r.f. stage—transmitter audio, reactance modulators, a.f.c., transmit v.f.o. and receiver v.f.o.). Both v.f.o.'s are in the box in the center of the chassis. The octal test socket is plainly visible at the bottom center of the chassis. All chassis can be unplugged and removed from the main front panel casting for servicing, however, the mechanical couplings for the main and v.f.o. tuning capacitor shafts have a latch which must be rotated a few degrees to allow the couplings to separate. The flexible shaft controls have allen set-screws that must be loosened to remove these items.

make sense. With a deviation control added, it could be used anywhere in the 6 meter band (The receiver would be the weak point however as it would be wide, but in the absence of interference would not be any great disadvantage. All in all, I've found it an inexpensive way to get on f.m. on those two bands. ■

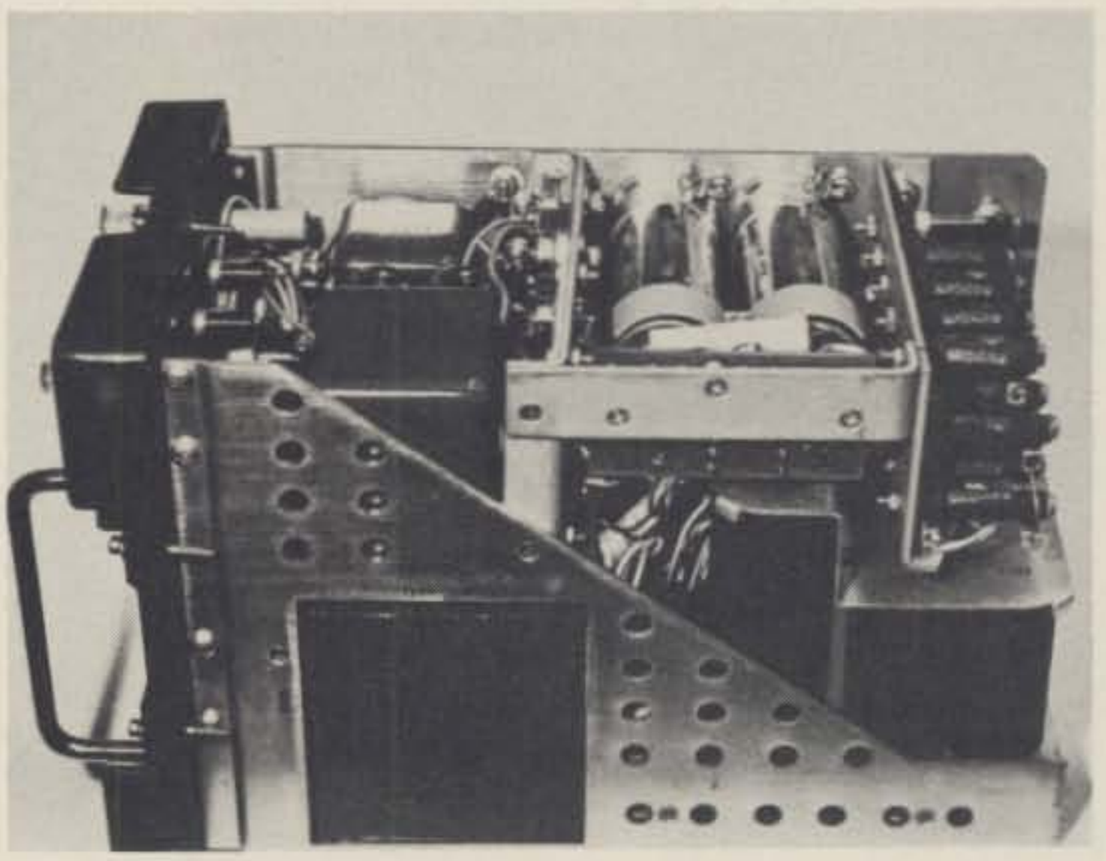


Fig. 8—Navy power supply removed from the cabinet. The adjustable resistor mentioned in the text is seen in the upper right hand corner. If any of the plug-in filter capacitors are replaced (located below and to the left of the group of power resistors) they must have a cardboard insulating cover as the original capacitors do.

Do you have some spare time and a HT? With a little patience you can add a touch-tone pad to your HT and reward yourself with increased enjoyment.

Put A Touch-Tone Pad INTO Your HT

BY JAMES E. ARCONATI,* KØFBJ

The increase in the use of touch-tone for control and autopatch access of repeaters has created a need for a small, reliable tone encoder that could be used with the popular hand-carried transceivers. So when Motorola introduced its new IC designated the MC 14410, it seemed like a natural for use with HT's. A number of local amateurs were quick to mount a keyboard on the side of their handie-talkies with the MC 14410 and electronics inside. Since my Standard SRC-146A is already rather large physically, I decided to install the keypad and encoder with no increase in the size of my rig. Although this article will deal with installation of the encoder in the SRC-146, it could easily be applied to most other amateur handie-talkies.

*4840 Lockwig Trail, Florissant, Mo. 63033

Remove the nameplate by pushing it from inside of the cover. The nameplate is glued in place and may require a little prying to get it loose from the cover.

The Standard SRC-146A Handie Talkie can be equipped with a touch-tone dial built into the back cover. The HT is no larger that it was before the conversion and it still fits in its carry-case.

The MC 14410 is a CMOS integrated circuit in a 16-pin DIP that digitally synthesizes the eight tones used in the touch-tone dialing system. Inputs from a 4×4 or 4×3 keypad generate the 4-row and 4-column input signals in a 2-of-8 format. It requires only 4.4 to 6 v.d.c. at 4 to 6 ma and an external 1 MHz crystal (plus a capacitor and a resistor or two to match it to the radio.) Unlike a number of other small encoders, the MC 14410 is almost totally immune to r.f. and can be mounted in close proximity to the transmitter with no special shielding or bypassing.

(Continued on page 69)

JOHN A. ATTAWAY, K4IIF, ON

DX

The *CQ* DX Award's Advisory Committee, in cooperation with the *CQ* staff, has considered the idea of a plaque to be awarded to DXers who have demonstrated excellence in the WPX Program, and has voted in favor of it.

There was considerable discussion with regard to requirements. Suggestions from the Committee ranged all the way from a requirement for 1000 prefixes, all 6 band endorsements and all 6 continental endorsements on *both* c.w. and phone, down to the more modest suggestion of separate plaques for c.w. and phone requiring 500 prefixes on the single mode plus 5 of the 6 band endorsements and 5 of the 6 continental endorsements.

After reviewing the Committee's suggestions, it was the concensus of the staff that it is too easy to amass prefixes on one mode, and that the operator should prove his versatility by demonstrating proficiency on both c.w. and phone. However, the requirement for 1000 prefixes plus all of the endorsement stickers on both modes would be too difficult. For example, it is particularly hard to earn the continental endorsement for South America on c.w. Therefore, we settled on the following requirements which will make the award a real challenge without being overly restrictive:

1000 prefixes mixed mode
all continental stickers mixed mode
band stickers 80-10 meters mixed mode
500 prefixes on c.w.
500 prefixes on phone & s.s.b.

We did not require the 160 meter sticker as much of the equipment in use today does not provide 160 coverage. In addition, many DXers have problems regarding space for a good 160 antenna. However, to encourage the use of 160 meters wherever possible, a 160 plate or bar will be available which can be added to the plaque as an endorsement. A charge of $10.00 will be made to cover a portion of the cost of processing and handling the award.

*P.O. Box 205, Winter Haven, FL 33880.

The CQ DX Award Program

SSB

441....I4ZSQ
442....UA9YE
443....UI8OM
444....UA1LL
445....UK4WAC
446....UQ2IL
447....UA3ERD

C.W.

210....OK1IBF
211....UA9JH
212....UL7HD
213....UA4SM
214....UD6CN
215....UA3GO
216....UV3WT
217....UC2AF
218....UA3RH
219....UV3QQ
220....UA1PU
221....UY5OQ
222....UK4WAC
223....UD6BW
224....UW3PW

Endorsements

UA3GO, UA9JH 150, I9WEH 250, 28mhz UA9CBO
Low Band 3.5/7mhz G2GM

Complete rules and application forms for the CQ DX Awards program can be obtained by sending a business size, No. 10 envelope, self-addressed and stamped to "CQ DX/WPX Awards", Box 3388, San Rafael California 94902.

It was the unanimous opinion of the Committee and staff that this award would *not* be started from "scratch," because of the great QSLing burden it would create for the rare stations and their QSL Managers. Contacts back to November, 1945 will be accepted. Applications may be made starting Jan. 1, 1977.

It is our hope that with WARC '79 in our immediate future, this new award will contribute to increased band occupancy and a stronger position for amateur radio.

HERE AND THERE

Major DXpeditions—At presstime in July, Lloyd and Iris Colvin, the "dynamic duo of DX," are temporarily back home in California before starting the next phase of their second major DXpedition. To date, they have made some 42,500 QSO's from rare Pacific countries as follows:

VR1Z, Ellice — 4000 QSO's with 116 countries
VR8B, Tuvalu — 8000 QSO's with 83 countries
3D2KG, Fiji — 7500 QSO's with 113 countries
C21NI, Nauru — 7500 QSO's with 116 countries
FKØKG, New Caledonia — 7500 QSO's with 111 countries
YJ8KG, New Hebrides — 8000 QSO's with 114 countries

Contacts were about evenly divided between c.w. and s.s.b. As always, QSL's go to the YASME Foundation, P.O. Box 2025, Castro Valley, CA.

Also at presstime in July, Dr. Sam Hutson, K5QHS, has completed an operation from Mayotte as K5QHS/FH8, and is on from Moroni signing D6A. Other rare countries in that area were on tap. Send your QSL's to Dr. Sam's home QTH in Arkansas.

Bill Rindone, WB7ABK, has operated/TA from Turkey and was enroute to rare African and Indian Ocean countries. With the political situation in turmoil in that part of the world, we pray for the safe return of both Bill and Dr. Sam.

New Prefixes—Over the past several years the number of new prefixes has increased dramatically as many new countries emerged in Africa and elsewhere, and many governments accorded their amateurs the right to use special prefixes both to commemorate historical events and to

Ermino "Mino" Marchetto, I3MMM, of Vicenza, Italy has confirmed the I3 prefix for many WPX chasers, in cooperation with Ed, W3JZJ, who was second op for a time. (Tnx W3JZJ)

The WPX HONOR ROLL

The WPX Honor Roll is based on confirmed *current* prefixes, which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

Mixed

W4LRN 1600	ON4QX 1203	WA5VDH ...1060	K6ZDL 931	WA0KDI 824
WA6MWG ..1378	DJ7CX 1202	W3GJY 1056	WØAUB 929	W6NJU 811
F9RM 1343	W4BQY 1188	K6SDR 1037	SM7TV 905	W9ZTD 807
W6TCQ 1325	W4WSF 1185	W9FD 1035	W3YHR 882	WA6TAX 805
VE3GCO ...1300	YU1BCD ...1182	YU1AG 1002	YU2OB 881	SM6DHU 803
W2NUT 1258	W8ROC 1181	YU2DX 995	WA6JVD 875	IT9AGA 791
W9DWQ 1253	WB4KZG ...1150	K4KQB 960	W4BYU 859	K2ZRO 782
W4CRW 1251	PAØSNG ...1146	W4IC 950	WA1JMP 857	YU4EBL 782
W3PVZ 1250	WA2EAH ...1100	DL1MD 940	W6ISQ 847	WØSFU 750
WB2FMK ...1240	WA6GLD ...1100	K2AAC 933	WAØCPX 844	K7NHG 719

SSB

W4NJF 1331	DK2BI 1003	K2POA 883	PY3BXW 808	WA5LOB 747
IØAMU 1300	I8YRK 1012	ZL3NS 874	WB4SIJ 803	W6YMV 720
F9RM 1278	I4ZSQ 1001	DL1MD 858	W4IC 800	WB6DXU 708
W6TCQ 1155	DL9OH 954	W3YHR 857	WB4KZG 800	CX2CN 702
I8KDB 1106	HP1JC 954	WA6TAX 855	DJ7CX 800	WB2FMK 700
WA6MWG ..1090	WB2NYM ...941	WA2EAH 850	OE2EGL 780	CR7IK 613
W9DWQ ...1083	YU1BCD 940	W6RKP 822	G3DO 765	I4LCK 608
IØZV 1067	CP1PK 923	IT9JT 8331	OK1MP 763	
W4WSF 1048	F2MO 904	W3DJZ 818	YU1AG 758	
PAØSNG ...1034	WØYDB 884	WA5VDH 811	W2EHB 750	

C.W.

W8LY 1256	YU1BCD 962	WA2HZR 853	K2AAC 796	VO1KE 700
W8KPL 1238	W9FD 944	IT9AGA 825	WA5VDH 796	W6ISQ 685
WB2FMK ...1085	W6TCQ 931	K7ABV 812	W4BYU 768	K2ZRO 649
WA6MWG ..1039	G2GM 911	VK3AHQ 809	W4IC 754	VE4OX 600
DL1QT 1030	W3ARK 910	HYU1AG 804	W4WSF 754	WB4KZG 600
ON4QX 1023	W2HO 885	WA6JVD 803	I6SF 726	
W2AIW 972	VO1AW 873	K6ZDL 803	WA2EAH 700	

participate in the *CQ* Worldwide contests. The year 1976 and the American Bicentennial have produced a peak which will probably stand for many years. Literally millions of QSO's have been made using AA, AC, AD and other bicentennial prefixes this year, and the following are additional new ones emerging this summer:

WG1 — WG1JFK operated from the Kennedy Memorial at Runnymede, Surrey, England during the July 4 holiday using both c.w. and s.s.b. There are unsubstantiated rumors that this will count as a new country.

WS2 — WS2JRA celebrated the 50th Anniversary of the South Jersey Radio Club. QSL to K2AA.

WY6 — Send cards for WY6FDA contacts to WA6WMT.

KC7 — The first centennial of the Battle of the Little Big Horn was commemorated by KC7LBH. QSL to WA7OBH.

N6 — N6V was connected with the MARS Viking Program. QSLs go to W6VIO.

N5 — N5MAR radiated from the 10th Anniversary Meeting of MARCO, the Medical Amateur Radio Council, in Dallas, Texas. QSL to Box 18114, Dallas.

N9 — N9TRF operated July 10 and 11 from the Fort Wayne Three Rivers Festival in Indiana. Cards go to W9LT.

NN3 — NN3SI is the new amateur radio station at the Smithsonian Institute in Washington.

NC4 — NC4CM, from Freedom Park in Charlotte, N.C., was a July 4 event with a twist. Bronze coins, cast in commemoration of the Mecklenburg Declaration of Independence, May, 1975, were awarded to the first station worked by NC4CM in each country and each U.S. state. QSLs go to W4CQ. (Darn good call!—DX Ed.)

NC4 — NC4NHC operated on June 19, 1976. Send cards to the Cape Fear Amateur Radio Society, Methodist College, Box M-618, Fayetteville, N.C. 28301.

GB3 — Not a terribly rare prefix, but GB3USA from George Washington's ancestral home in northeast England is worthy of note.

CT6 — From July 18-Aug. 1, 1976, CT6CAL operated from Almourol Castle in Ribatejo Province, Portugal. QSL to CT6CAL, Almoural, Portugal.

5N2 — Not rare, but 5N2BSJ, Aug. 28-Sept. 14, 1976, was from the first All African Boy Scout Jamboree in Lagos, Nigeria. Cards go to P.O. Box 448, Apapa, Lagos, Nigeria.

CZ2 — CZ2O was the Canadian Olympics station in Montreal. Cards go via the VE2 Bureau.

Russian Interest — The *CQ* DX Department has enjoyed a cordial working relationship with the E. T. Krenkel Radio Club in Moscow for many years, and there has been a moderate but steady flow of Russian applications for *CQ* award certificates.

Many happy DXers have gotten both country and continent confirmations from Tom, WB6KIL/KC4AAC of Palmer Station, Antarctica. Tom has been very active on 3.8—28 MHz since November, 1975 using several beams and wire arrays. His signals have been 5/9 worldwide. (Tnx WA6GLD)

However, over the past 2 weeks we have received WAZ applications from 7 U.S.S.R. amateurs, WPX applications or endorsement requests from 35 UA DXers and VPX applications from 12 Soviet short wave listeners. This kind of surge, if it continues, will find us sending more award certificates to the U.S.S.R. than to any other country.

Greece on 80 Meters — SVØWTT advises us that SV amateurs may now operate on 80 meters, in the 3.5 — 3.6 MHz band segment, using the modes A1, A3 or A3J.

DX Club Officers — Following our past policy of giving credit to the hard working officers of our DX clubs and enabling them to keep up with each other, here are several recent club officer listings:

On the left is Jean Alliaume, F5JA, and on the right his XYL Juliette, F5SJ. The Alliaume's have 2 children and 1 grandchild. Jean has been an REF member since 1934 and was a radio operator for the French Third Army in World War II. He took out his present license in 1964 and has operated /W1, /W2 and /W6. He has the call DJ0QV in Germany and HB9XSX in Switzerland. His country score is 294 confirmed on s.s.b. and WAZ.

The WAZ Program

S.S.B. WAZ

1326....JA6RIL
1327....I3DHN
1328....JA1IST
1329....JA1RJR
1330....JA1XPQ

C.W.—Phone WAZ

3971....W5KFN
3972....OZ1VY
3973....WA7ZLC
3974....W6PN
3975....F5FJ
3976....DL6KC
3977....DJ7RJ
3978....DJ3NK
3979....HAØKLE
3980....WA4BTC
3981....DA1OR
3982....OZ8CN
3983....W7AWH
3984....W5KKZ

Complete rules for both the Single Band and regular WAZ programs appeared in the May, 1976 issue, pgs. 54-57. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

The reason it's difficult to work SV's on the 4th of July! Many are at the country home and shack of SV1AT. Front, left to right: SV1AA (The OM of SV1's), SV1AE, SV-1AT, SVØWTT, SVØ-WJJ. Rear, left to right: SV1BF, SVØ-WPP, SV1AS, SV1-AG (Pres. of RAAG), SV1AN, SV-AD. (Tnx SVØWTT).

Canadian DX Club: President — Paul Hicks, VE3BBH; 1st Vice President — Bob Nash, VE3KZ; 2nd Vice President — Yuri Blanarovich, VE3BMV; Recording Secretary — Don Newlands, VE3HGN; Contest Chairman, Yuri Blanarovich, VE3BMV; Secretary —James Montagnes, VE3BIF; Awards Manager — Ron Nickle, VE3BIZ; Public Relations — Jack Reed, VE3GMT; QSL Bureau — James Montagnes, VE3BIF; CQ DX Committeeman — Jack Reed, VE3GMT; and Directors—Martin Rosenthal, VE3MR; Dennis Ratcliffe, VE3DDR and Alan Leith, VE1AL.

Delta DX Association: President — Fred Sicuro, W5KKZ; Vice President — Russ Guidry, K5YMY; Secretary — John Wondergren, W5RKR; Treasurer — John Meyer, W5JFB and *CQ* DX Committeeman — Russ Guidry, K5YMY.

North Florida DX Association: President — Ron Blake, WA4EYR; Vice President — Dick Knox, WB4UYD; Secretary-Treasurer — Billy Williams, AA4UFW and Activity Manager — George Werner, AC4ORT.

Long Island DX Association: President —Michael Hacker, WA2BVU; Vice President—Dave Ferrier, W2GKZ; Secretary—Morton Bass, WA2CFD; Flash Card Service—Howard Geberth, W2NUT/1; Treasurer—Gerry Offenberg, WB2HXD and Bulletin Editor—J. Harvey McCoy, W2IYX.

Western Washington DX Club: President—John Gohndrone, W7KWC;

Carlos Monti, IØMBX, of Rome Italy was recently credited with s.s.b. WAZ #1320. Although licensed only since 1973, Carlos has 250 countries confirmed, and in addition to WAZ he has earned the CQ S.S.B. DX Award, WPX-500, DXCC, ADXA, WAC and several other awards.

Vice President—Gene Eggebraten, W7GVF; Secretary—Ed Eckert, WA7-GRE; Treasurer—Dick Bennett, WA7-RUY; Bulletin Editor—George Loetz, WA7JCB; and Trustees—Bill Bennett, W7PHO; John Dack, W7KH; Homer Spence, W7EXM; Rod Lindous, W7YBX; Jerry Heron, W7APN; Phil Fliss, W7JIG and Chip Margelli, K7VPF.

Northern California DX Club: President— Orm Meyer, K6QX; Vice President—Richard Lawton, K6QZ; Secretary—Henry Davis, K6IXS and Treasurer—Rod Deakin, WA6CVU.

Fred, PY7AZQ, another recent WAZ winner, has 273 countries worked using a Heath SB 101 to dipoles for 40, 20 and 15 meters. Fred is 31 years old and a CQ subscriber.

Administrative Changes in DX Department

We have some good news and some bad news. The bad news is that Hugh Cassidy, WA6AUD, Assistant DX Editor for the past year, has tendered his resignation. As most of you know Hugh is also Editor and Publisher of the *West Coast DX Bulletin* which he founded almost 10 years ago. He no longer has time to do both and we can understand that the Bulletin is his first love.

The good news is that we have a very able replacement in Rod Linkous, W7YBX, past president of the Western Washington DX Club and editor of the club bulletin, *The Totem*

(Continued on page 72)

The WPX Program

Mixed

529....WA2GEZ
530....YU1BFR
531....W0IUB
532....K9HQM

2 × SSB

911....I1DWH
912....W4WRY
913....G4BBA
914....K2QIL
915....IT9IUS
916....W4KA
917....G3XPO
918....K9HQM

C.W.

1485....W6MYH
1486....OK1KYS

Endorsements

350 G3XPO, WA6EVX/KG6, K2QIL, OK1DVK, OK1KYS, W4KA, W6YMH, ZD9TM
400 CT1BY, G3XPO, OK1DVK, PA0LVK, W4KA, W4WRY, W6YMH, ZD8TM, OK1KYS, K9YQW
450 CT1BY, I2BVS, OK1KYS, K9UQN, WA2CCF, W4KA, W4WRY, WA2GEZ, WØIUB, YU1NFR
500 I2BVS, OK1KYS, WA2CCF, W4KA, W4WRY, W9MYG, WØIUB, YU1NFR
550 KH6HC, OK1KYS, WA2CCF, WDX20BU, W4KA, W4WRY, W0IUB
600 WA2CCF, W4KA, W4WRY, WA0TKJ, WØIUB
650 PY2ELV, WA1JMP, WA2CCF, W4KA, W4WRY, WØIUB
700 PY2ELV, WB2FMK, W4WRY
750 F2YT, W4WRY, W5LPO, WA2HZR
800 W5LPO, WA2HZR
850 WZ2HZR, K7NHG
950 I8YRK, K8MFO
1000 I8YRK
1100 WA6GLD
1250 WB2MFK
1300 IØAMU
160mtrs OK1KYS
80mtrs OK1KYS
20mtrs K9YQW, W0IUB
15mtrs WØIUB
10mtrs K8MFO, WØIUB
Europe: K9YQW, OK1KYS, WØIUB
Asia: WA6EVX/KG6, WØIUB
North America: K9YQW, W0IUB
South America: K8MFO, WØIUB
Oceania: WA6EVX/KG6

Complete rules for WPX can be found on Page 67 of the February 1972 issue of CQ Magazine. Application forms may be obtained by sending a business size envelope, self-addressed and stamped, to "CQ DX/WPX Awards", Box 3388, San Rafael, Calif. 94901.

A. EDWARD HOPPER, W2GT, ON

Awards

The September "Story of The Month" as told by Hazel is:

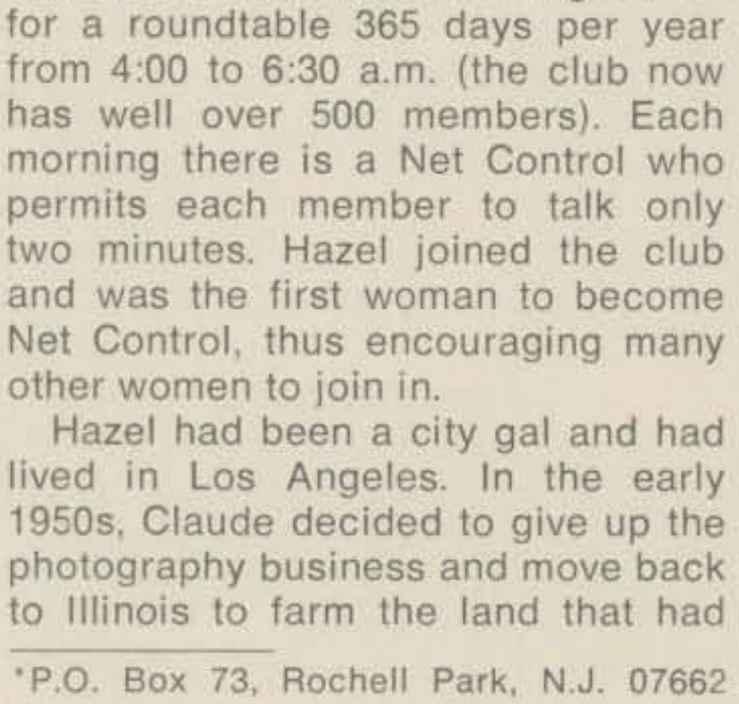
Hazel V. Cain, K9QGR.
All Counties #130, 5-16-75.

Hazel got interested in amateur radio from listening to her husband, Claude, K9HRC (Story in *CQ* March 1975) who has been active since 1958. Her real incentive arose after moving from Los Angeles to De Witt County, Illinois, her mother still in California became ill and amateur radio was a great way to keep abreast of her condition.

Hazel started as KN9HRC but in about one year, obtained her General license. Shortly after that, the Breakfast Club was started with eight men for a roundtable 365 days per year from 4:00 to 6:30 a.m. (the club now has well over 500 members). Each morning there is a Net Control who permits each member to talk only two minutes. Hazel joined the club and was the first woman to become Net Control, thus encouraging many other women to join in.

Hazel had been a city gal and had lived in Los Angeles. In the early 1950s, Claude decided to give up the photography business and move back to Illinois to farm the land that had belonged to his grandfather.

*P.O. Box 73, Rochell Park, N.J. 07662



Hazel Cain, K9QGR, (Students said Hazel would not let them raise cain!).

Special Honor Roll
(All Counties)

#148—Carl A. Prochaska, W9ABM 6-10-76.
#149—M. D. "Mike" Baustian, WAØKQQ 6-15-76.
#150—Herbert M. Perry, WØGQR 6-15-76.

Hazel knew little about prairie farms, but had read that women had to pump water and use an outhouse.

When they got to the farm, sure enough there was a pump in the front yard and an outhouse out back. But inside, the house was very modern and had hot and cold running water and a modern bathroom, so the day was saved.

After getting settled and looking out the windows where one could see for miles, Hazel wondered how she would ever get to know anyone. How would she meet people and make friends, or even have anyone to talk to?

All this is past history, for she entered into community life. She is past worthy matron of the Eastern Star, their organist; is past worthy high priest of the White Shrine; secretary of the county chapter of the D.A.R. (Daughters of the American Revolution); is a local dressmaker, writes for three newspapers, and does her own photography, and is an active church member. She also does ceramics and gives instructions to home extension and 4-H groups.

Yes, she also has time for farm life, mostly taking care of the animals. Seems strange that all emergencies crop up when Claude is away on a trip.

Would Hazel move back to Los Angeles, no never, the only interest that California has that Illinois does not have, is their four grandchildren.

For a few years, Claude and Hazel have been living in Apache Junction, Arizona. While there, Hazel has kept busy teaching a lot of different crafts, being a reporter for the *Park*, as well as secretary and treasurer for the local club. By the time you read this, they will be back in Illinois.

Claude had both eyes operated on and Hazel had some surgery so they have made few recent trips. Hazel hit her 71st birthday, April 30 (belated Happy Birthday, I'm close behind—Ed., W2GT).

So congratulations to Hazel and Claude, the only OM/XYL All Counties Combination—I thought that Mabel and Arcy, K5SGJ and K5SGK would make it, but apparently they lost interest after each made USA—CA-3000 #8 and #12.

USA-CA Honor Roll

2500		2000		1000	
WA2GLU/WB5QLU	213	WA1VXW	252	WB5LOZ	398
WA1VXW/WB4SLS	214	VE3RN	253	W1III	399
WA1III	215	W1III	254	**500**	
W2MEI	216	WBØJYB	255	WB5LOZ	1106
		1500		I6FLD	1107
		VE3RN	299	WA3UXU	1108
		W1III	300	W6NT	1109
				WA2WCW	1110
				W1WY	1111

Awards Issued

Carl Prochaska, W9ABM made it #148 All Counties, endorsed All S.S.B., All Mobiles.

Mike Baustian, WAØKQQ was issued #149 All Counties.

Herb Peery, WØGQR won #150 All Counties endorsed All 75, All 2×S.S.B., #1 thus endorsed.

Regarding *All Counties*, here are some interesting and then some sad statistics:

Nine went to the 1st call area; 12 to the 2nd; 6 to the 3rd; 22 to the 4th; 14 to the 5th; 11 to the 6th; 14 to the 7th; 19 to the 8th; 10 to the 9th; 24 to the 0s; 7 to stations outside the USA and 2 to s.w.l.s.

The first ten went to: K9EAB, WØMCX / W0BK, K8CIR, W2QHH, W0JWD / W0BL, W0GYM, K1QZW, K8IWI, K8KOM and W5AEB.

Those great gals (YLs/XYLs) who

received them are: Bertha, WA4BMC #19, January 21, 1970; WA7IRD, "Willie", #29; Cleo, WA0SHE #42; Ella, W0AYL #65; Dot, K5BTM #85; Helen, WA3GLJ #108; Avis, W8WUT #115; Hazel, K9QGR #130; Phyllis, K1QFD #132; Bea, WA2GPT #137; and Pat., WA7GMX #144.

Outside the USA, in order of their issuance are: ZL1KG, TG9UZ, VE3-CBY, G4JZ, VE7ATI / VE6ABP, GW3NWV and VE4QZ.

Those issued to s.w.l.s were to WPE6ETT and WPE9ETT/SH-W5-109.

Silent Keys are: K9EAB, WA3HGV, W6HVU, W5ROP, W6JHV, K2CPR/-K200, WA4MGC, WA9OFF, and W6-UNP.

Howard Siegel, WA2GLU/WB5QLU (The Road Runner) acquired USA-CA-2500.

Emil Bitterlich, Jr., WA1VXW (ex-WB4SLS) added USA-CA-2000 and 2500 to his collection, endorsed All 14, all S.S.B., all mobiles.

Dave Crowley, Jr., W1III collected USA-CA-1000, 1500, 2000 and 2500.

"Steady" Lindell, W2MEI claimed USA-CA-2500 endorsed All 2×-c.w.

Lee Foster, VE3RN applied for USA-CA-1500 and 2000 endorsed All S.S.B.

Geo Dunn, WBØJYB collected USA-CA-2000 endorsed All S.S.B.

Garry Purcell, WB5LOZ received USA-CA-500 endorsed all 75, All S.S.B., and USA-CA-1000, Mixed.

Antonio Cardelli, I6FLD qualified for USA-CA-500 endorsed all S.S.B., #8 Award to Italy and #1 to I6.

Mixed USA-CA-500 Awards went to:

Howard Gifford, WA2WCW and
Tyler Steward, WA3UXU.

Alva Davis, W6NT got USA-CA-500 endorsed All A-1.

Although he probably has enough QSLs to qualify for USA-CA-3000 (he being a BIG contest man and active in state and call area QSO Parties), I finally got Frank Anzalone. W1WY/-W2WC to apply for USA-CA-500.

Awards

The Bicentennial Year being over half gone, last month I tried to remind you of some of *The Bicentennial Awards;* Here are some more!

Cherryland Radio Club: An attractive certificate will be awarded during the Bicentennial year of 1976 to any amateur station that works their club station, WB8VKB, uses their club repeater WR8AEN, or who works five club members. The simple rules are: Confirm your QSO with your QSL card/cards and send along with a stamped (self addressed) 8½ × 11 envelope and 50 cents to: Wells Chapin, W8GI, 507 Franklin, Kingsley, Michigan 49649.

L to R: Active CT1s on ICH Net. Miro, CT1UA; Ad, CT1RM; CT1UE, Cesar; and Charlie, CT1BY. QSL managers are: 1UA to WA3VLB; 1RM to WB2SJQ; 1UE to K5JBC; 1BY to WA4CNI. By the time you read this probably CT1TZ to K9GTQ.

Worked All States (WAS) 1976: For details send s.a.s.e. to A. R. R. L., 225 Main Street, Newington, Connecticut 06111.

The St. Vincent Amateur Radio Club, West Indies Award: Issued for having two-way communication by amateur radio with 3 amateur radio stations on the Island of St. Vincent. There is no time limit, send full log data and $1.00 or 10 IRCs to the St. Vincents Amateur Radio Club, P.O. Box 142, Kingston, West Indies.

Worked All Europe Award: This one of the most sought after awards by DX stations and issued by DARC. Awarded to amateur radio stations for contacts with almost all European countries and islands on different amateur bands and is also available to s.w.l.s. The rules apply accordingly.

The Award is issued in three classes: WAE III, WAE II, and WAE I. The classes are based on the number of European countries worked and a score of country points added up from the different bands.

Applicants for the basic WAE III have to submit QSL cards proving two way contacts with at least 40 different countries of the "European Countries List". At the same time the cards must prove a minimum of 100 country points.

WAE II requires 50 countries with a total of at least 150 points. For WAE I 55 countries and 175 points are needed.

After receiving the basic award, only the necessary additional confirmations are required for a higher class.

Each European country counts one country point on each of the six HF-bands (1.8 MHz, 3.5, 7, 14, 21, and 28 MHz). Only four bands per country, however, are eligible for the point score. Five points per country can be achieved by working the same station on five bands. Two additional points per country can be obtained by a contact on *one* of the v.h.f./u.h.f.-bands. Stations outside Europe may claim 2 points for each European Country on 1.8 MHz and 3.5 MHz.

The WAE is issued in two divisions: Exclusively telegraphy, i.e. two way c.w. contacts. Exclusively telephone, i.e. two way a.m/.f.m. s.s.b. contacts. Holders of WAE I get a special WAE-badge.

General Rules: DARC's official DX-awards Europa Diplom, WAE, and EU-DX-D can be obtained by licensed radio amateurs and s.w.l.s all over the world. All contacts must be from the same country. Awards for club stations will be issued to the club, not an individual operator. The DARC-DX-awards are based on the "European Countries List". All amateur bands for which the applicant holds a valid license may be used. A set of application forms for the DARC-DX-awards is available for a large size s.a.e. plus 3 IRCs at the address stated later. The use of these official forms is obligatory. QSL cards

The St. Vincent Award.

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for all contacts claimed, must be submitted with the application. All cards must be presented in their original form. Any altering or forging will result in disqualification. The service charge is 2-US dollars ($2.00) per award, 1-US dollar ($1.00) per endorsement or equivalent. The extra charge for the return of cards by registered mail is 1-US dollar ($1.00). All applications go to: DARC-DX-Awards, P. O. Box 262, D 895 Kaufbeuren, Germany (FRG). But North American residents may send their applications, logs to: Hartwin E. Weiss, WA3KWD, 323 North St. Millersburg, PA. 17061. Applications on to the Europa Diplom Honor Roll should arrive before the end of May or November. Service charge: 3 dollars for awards, 2 dollars for endorsements. Next month I will show photographs of their Europa Diplom and EU-DX-D, in the mean time may I suggest that you send for the required application forms. "European Countries List": C31; CT1; CT2; DL; DM; EA; EA6; EI; F; FC; G; GC Guer; GC Jer; GD; GI; GM; GM Shetland; GW; HA; HB9; HBØ; HV; I; IS; IT; JW Bear; JW; JX; LA; LX; LZ; M1; OE; OH; OHØ; OJØ; OK; ON; OY; OZ; PA; SM; SP; SV; SV Crete; SV Rhodes; SV Athos; TA1; TF; UA1 3 4 6; UA Franz Josef Land; UA2; UB5; UC2; UN1; UO5; UP2; UQ2; UR2; YO; YU; ZA; ZB2; 3A; 4U1; 9H1.

Naturally the decisions of the DARC-DX-Committee are final. New certificate holders will be published in *"cq-DL"*.

Dunakanyar Diploma: (The Danubian Bent Diploma). The Radio Amateur Society of the County Pest issues this beautiful decorative diploma to publicize one of the most beautiful regions of Hungary which is full of historical traditions. Also to encourage HA7 amateur activity. It is offered to all amateurs of the world. The applicant should submit proof of having contacted or heard HA7 amateurs as follows: DX-stations 5 QSOs; European stations 20 QSOs; Hungarian stations 40 QSOs. All contacts are valid after January 1st, 1970. There are no band or mode restrictions. The QSLs do not have to be sent, send full log data. The fee is 6 IRCs/FT. 36. for HA stations. Apply to: P. R. A. Sz.-H-1387 Budapest, P. O. Box 36, Hungary. An activity contest is organized every last weekend of July.

Notes

No more space so I'll just say, write and tell me, How was your month?

73, Ed., W2GT

Worked All Europe.

Duna-Kanya Diploma (Danubian Bend Award).

GEORGE JACOBS, W3ASK, ON

Propagation

BULLETIN

THE U.S. DEPT. OF COMMERCE PLANS TO DISCONTINUE SHORT-TERM PROPAGATION FORECASTS FOR THE H. F. SPECTRUM, INCLUDING THE BROADCASTS GIVEN 14 MINUTES PAST EACH HOUR ON WWV. THE PLANNED SEPT. 30 CLOSEDOWN IS BASED ON BUDGETARY CONSIDERATIONS AND THE BELIEF IN THE DEPT. OF COMMERCE THAT INTEREST IS DWINDLING IN H. F. COMMUNICATIONS.

If you haven't already done so, be sure to get a letter off to the Dept. of Commerce protesting the proposed shut-down of the Tele-Communication Services Center at Boulder, where the forecasts are prepared. There's still time to save the forecasts, if we can show the Dept. of Commerce that h.f. radio is still very much alive. You might send a copy of your letter to Congressman T. E. Wirth, who acts as a watch-dog on these matters for the House Committee that appropriates funds for the Boulder operation.

If the Telecommunication Services Center at Boulder is shut down on Sept. 30th, as planned, radio amateurs and all the other users of the h.f. spectrum will be denied realtime reports and forecasts of propagation conditions. THERE IS NO ALTERNATIVE FOR THE WWV SERVICE. It will also mean the end to the weekly reports put out by the Center, as well as the around-the-clock telephone data line. Closing the Center will return the state of the art to the dark ages!

Protest the planned shut-down, and help save the WWV propagation broadcasts by writing:

Dr. Douglass Crombie
Director, ITS/OT
U.S. Dept. of Commerce
Boulder, Colorado 80302

Don't forget to send a copy to Congressman Wirth.

There isn't much time left, so get that letter off now!

*11307 Clara St., Silver Spring, MD, 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Sept., 1976

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: 11	A	A	B	C
High Normal: 2, 17-18, 25-26, 29-30	B	B	C	D
Low Normal: 1, 3-5, 8-10, 12, 15-16, 24, 28	B	C	D	E
Below Normal: 6-7, 13-14, 19, 22-23, 27	C	D	E	E
Disturbed: 20-21	D-E	E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, a path shown in the Charts with a propagation index of (3) should be a *fair* opening (C) on Sept. 1; *good* (B) on the 2nd; fair *again* on the 3-5; and *poor* (D) Sept. 6-7, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768, or check WWV at 14 minutes past each hour.

Equinoctial Propagation

Mid-September through mid-October marks the fall equinoctial period. A similar period occurs in the spring, between mid-March and mid-April.

The fall equinoctial period marks the time that the sun crosses the equator on its apparent travel into southern skies. During this period the hours of daylight and darkness are just about equal in length throughout the world. Sunrise should take place at approximately 6 a.m. local time (7 a.m. daylight) and sunset at about 6 p.m. local time (7 p.m. daylight).

This results in an ionosphere of almost equal characteristics over large areas of the world, and is usually the best time of the year for long DX openings between the temperate regions of the northern and southern hemispheres, on all h.f. bands. Look for more frequent openings between the USA and South America, South Pacific, South Asia and southern Africa, especially on **20 meters** for a few hours after sunrise and again during the early evening hours.

Long-path propagation is also usually optimum during the equinoctial period. In western states look for long-path openings from Europe and Africa on **20 meters** shortly after sunrise and again during the evening. Stations in eastern states can expect some long-path openings to the South Pacific during the late afternoon and early evening, and to parts of eastern Africa and Asia just after sunrise. Long-path openings may also be possible on **40 meters** during the sunrise and sunset periods.

In general, during September, expect **20 meters** to continue to be the best band for DX propagation. It should open in almost all directions for a few hours after sunrise, and remain open to several different areas of the world throughout most of the day and into the early evening. Signals should be a bit stronger than they were during July and August, but the band will close an hour or two earlier because of the shorter period of daylight.

A seasonal improvement is expected for DX conditions on **15 meters,** but solar activity is so low that considerably fewer openings are expected compared to the past several years. Best time to check for DX openings is from a few hours before noon through the afternoon hours. Best bet is for fairly good openings towards South America, but openings to Africa, the South Pacific and

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (15 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts cw or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10db loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Europe could occur from time-to-time.

Solar activity is much too low for any real **10 meter** DX openings, but some may be possible towards South America and other southern areas during the afternoon hours.

Improved nighttime DX propagation conditions are expected on **40, 80 and 160 meters,** as a result of increasing hours of darkness, and a seasonal decrease in static levels. *Forty* should provide the best chance for DX from sunset through the sunrise period. Check **80 and 160 meters** during the same time span, and especially an hour or so before sunrise.

For readers interested in short-skip conditions, for openings less than 250 miles try **80 meters** during most of the day and **160 meters** during the hours of darkness. Between 250 and 750 miles, **40 meters** should be best from about 9 a.m. to 5 p.m. local daylight time, and **80 meters** at other times. For openings between 750 and 1300 miles, try **20 meters** during most of the daylight hours: **40 meters** from sundown to about Midnight and **80 meters** from Midnight to sunrise. For openings beyond 1300 miles, **20 meters** should be best during most of the daylight, hours with **40 meters** optimum during most of the hours of darkness.

V.H.F. Ionospheric Openings

Auroral activity usually *increases* during the equinoctial periods. Look for some good *6 and 2 meter* auroral-type openings when conditions on the h.f. bands are BELOW NORMAL or DISTURBED. Check the "Last Minute Forecast" at the beginning of this column for those days likely to be in these categories during September.

Although summer-time sporadic-E ionization should fall off considerably during September, an occasional *6 meter* short-skip opening may still be possible over distances ranging between 1000 and 1300 miles. Best time to check is before Noon and during the early evening, but don't expect too much.

Sporadic-E propagation this past summer was exceptionally intense and widespread. For example, on Sunday, June 27 openings were reported on the *2 meter* band up to the one-hop limit of 1300 miles, and there may have been two-hop openings over greater distances. On 6 *meters,* a great number of two-hop openings have been reported. The big surprise, however, was on *10 meters,* where several *trans-Atlantic* openings took place, apparently by three-hop sporadic-E mode, since there was no evidence of F-layer propagation. The summer of 1976 may have set new records for sporadic-E propagation.

No major meteor showers are expected during September so few, if any, meteor-scatter type openings are likely to occur on the v.h.f. bands.

Sunspot Cycle

The plateau in solar activity reported last month continues. The Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 12.7 for May and 12.4 for June. This results in 12-month running smoothed sunspot numbers, upon which the cycle is based, of 16 for November and 16 for December, 1975. The provisional smoothed sunspot numbers for 1975, based upon the Swiss solar observations, are as follows:

Smoothed Sunspot Numbers
Provisional—1975

Month	SSN
Jan.	23
Feb.	22
Mar.	21
Apr.	19
May	17
June	16
July	15
Aug.	14
Sept.	15
Oct.	16
Nov.	16
Dec.	16

Of 42 sunspot groups observed during the first six months of 1976, 36 belonged to the present sunspot cycle (Cycle 20), and only 6 to the upcoming cycle (Cycle 21). The present cycle will end and the new cycle begin officially when the number of spots from each cycle is approximately the same. Present indications are that this will occur sometime between late 1976 and mid-1977.

A smoothed sunspot number of approximately 9 is forecast for this month.

This month's DX *Propagation Charts* cover the equinoctial period between September 15 and October 15, rather than the usual two month span. A *Short-Skip Propagation Chart* for September and October is also included in this month's column.

CQ DX Contest Special

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 30 and 31
Phone Section
November 27 and 28
C.w. Section

Following the practice of the past 25 years, next month's *Propagation* column will be devoted to a special, comprehensive forecast which will cover both Sections of the Contest.

A special two-month subscription to MAIL-A-PROP (5-issues), and covering both Sections of the Contest, will also be available for $5 airmail to the USA, Canada and Mexico, and $7 airmail elsewhere in the world. Checks must be sent *before* October 12 to:

MAIL-A-PROP
11307 Clara Street
Silver Spring, Md.
20902

73, George, W3ASK

September 15-October 15, 1976
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe & North Africa	10-15 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-04 (2) 04-05 (1)	20-22 (1) 22-01 (2)* 01-04 (1)
Northern Northern Europe & European USSR	10-13 (1) 10-13 (1)	07-08 (1) 07-08 (1) 08-10 (2) 10-12 (1) 12-16 (2) 16-17 (1)	18-20 (1) 18-20 (1) 20-04 (2) 04-05 (1)	21-04 (1) 21-04 (1)
Eastern Mediter-ranean & Middle East	10-14 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-16 (2) 16-17 (1)	19-21 (1) 21-00 (2) 00-01 (1)	22-00 (1)
Western Africa	09-11 (1) 11-13 (2)** 13-14 (3)** 14-15 (2) 15-16 (1)	08-10 (1) 13-15 (1) 15-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	20-23 (1) 23-02 (2) 02-04 (1)	22-03 (1)
Eastern & Central Africa	11-13 (1) 13-15 (2) 15-16 (1)	13-15 (1) 15-18 (2) 18-19 (1)	21-02 (1)	22-01 (1)
Southern Africa	09-11 (1) 11-14 (2)** 14-15 (1)	08-10 (1) 13-15 (1) 15-18 (2) 18-20 (1) 23-01 (1)	19-22 (1) 22-00 (2) 00-02 (1)	23-01 (1)
Central & South Asia	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 19-22 (1)	05-07 (1) 20-23 (1)	*Nil*
South-east Asia	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-18 (1) 20-22 (1)	06-08 (1)	*Nil*
Far East	17-19 (1)	08-09 (1) 09-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-22 (1)	06-08 (1)	*Nil*
South Pacific & New Zealand	14-16 (1) 16-18 (2)** 18-19 (1)	07-08 (1) 08-11 (2) 11-14 (1) 16-20 (1) 20-23 (2) 23-01 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1)	03-05 (1) 05-07 (2)* 07-08 (1)
Austral-asia	17-19 (1)**	07-08 (1) 08-10 (2) 10-12 (1) 14-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1)	04-05 (1) 05-06 (2)* 06-07 (1)
Carib-bean, Central America & Northern Countries of South America	09-10 (1) 10-13 (2)** 13-16 (3)** 16-17 (2) 17-18 (1)	07-08 (1) 08-09 (3) 09-10 (4) 10-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	19-20 (1) 20-21 (4) 04-06 (3) 06-07 (2) 07-08 (1)	21-23 (1) 23-04 (2)* 04-07 (1)
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	09-10 (1) 10-11 (2) 11-14 (1) 11-14 (1) 14-17 (2)** 17-18 (1)	07-08 (1) 08-10 (2) 10-11 (1) 10-11 (1) 14-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	21-23 (1) 23-01 (1) 01-03 (1) 01-03 (1) 03-06 (2) 06-07 (1)	02-06 (1)*
McMurdo Sound, Antarc-tica	15-17 (1)	07-09 (1) 18-20 (1) 20-22 (2) 22-00 (1)	00-03 (1) 03-05 (2) 05-07 (1)	04-06 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe & North Africa	10-14 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	21-23 (1) 23-01 (2)* 01-02 (1)
Northern Europe & European USSR	10-13 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-15 (2) 15-16 (1)	20-23 (1) 23-01 (2) 01-02 (1)	22-01 (1)
Eastern Mediter-ranean & Middle East	10-13 (1)	07-08 (1) 08-09 (2) 09-15 (1) 15-16 (2) 16-17 (1)	20-23 (1)	21-23 (1)
Western Africa	09-12 (1) 12-14 (2)** 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	20-23 (1) 23-01 (2) 01-02 (1)	23-01 (1)
Eastern & Central Africa	12-15 (1)	07-09 (1) 13-16 (1) 16-18 (2) 18-19 (1)	21-00 (1)	22-23 (1)
Southern Africa	09-11 (1) 11-14 (2)** 14-15 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-01 (1)	21-23 (1)
Central & South Asia	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1)	06-08 (1) 19-21 (1)	*Nil*

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 p.m., etc. Appropriate *daylight* time is used, *not GMT*. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level: for each 10 db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Eastern Mediter-ranean & Middle East	10-13 (1)	07-08 (1) 08-09 (2) 09-15 (1) 15-16 (2) 16-17 (1)	20-23 (1)	21-23 (1)
Western Africa	09-12 (1) 12-14 (2)** 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	20-23 (1) 23-01 (2) 01-02 (1)	23-01 (1)
Eastern & Central Africa	12-15 (1)	07-09 (1) 13-16 (1) 16-18 (2) 18-19 (1)	21-00 (1)	22-23 (1)
Southern Africa	09-11 (1) 11-14 (2)** 14-15 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-01 (1)	21-23 (1)
Central & South Asia	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1)	06-08 (1) 19-21 (1)	*Nil*
South-east Asia	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-21 (1)	05-08 (1)	*Nil*
Far East	16-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	03-05 (1) 05-07 (2)	06-08 (1)
South Pacific & New Zealand	12-15 (1) 15-18 (2)** 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1)	00-01 (1) 01-07 (3) 07-08 (2) 08-09 (1)	02-04 (1) 04-07 (2)* 07-08 (1)
Austral-asia	16-18 (1)**	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (1) 20-22 (2) 22-00 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1)	05-06 (1) 06-07 (2)* 07-08 (1)
Carib-bean, Central America & Northern Countries of South America	09-10 (1) 10-11 (2)** 11-13 (3)** 13-15 (4)** 15-16 (3)** 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-05 (4) 05-06 (3) 06-07 (2) 07-08 (1)	20-23 (1) 23-06 (2)* 06-07 (1)
Peru, Bolivia, Paraguay, Brazil, Chile, Argen-tina, & Uruguay	09-10 (1) 10-11 (2) 11-13 (1) 13-17 (2)** 17-18 (1)	07-08 (1) 08-09 (2) 09-11 (1) 13-16 (1) 16-17 (2) 17-20 (3) 20-21 (2) 21-23 (1)	21-23 (1) 23-02 (2) 02-04 (1) 04-06 (2) 06-07 (1)	23-02 (1) 02-04 (2)* 04-05 (1)
McMurdo Sound, Antarc-tica	15-17 (1)	17-20 (1) 20-22 (2) 22-00 (1) 08-10 (1)	00-03 (1) 03-05 (2) 05-07 (1)	04-06 (1)

September 15-October 15, 1976
Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	10-12 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1)	21-23 (1)
Central & Northern Europe & European USSR	10-12 (1)	08-09 (1) 09-10 (2) 10-12 (1) 12-14 (2) 14-15 (1) 22-00 (1)	20-00 (1)	21-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	08-12 (1) 12-14 (2) 14-16 (1) 20-22 (1)	20-23 (1)	21-22 (1)
Western Africa	11-14 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-17 (2) 17-18 (1)	21-00 (1)	22-23 (1)
Eastern & Central Africa	11-14 (1)	07-09 (1) 13-15 (1) 15-17 (2) 17-18 (1) 21-23 (1)	20-22 (1)	*Nil*
Southern Africa	10-14 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Central & South Asia	17-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 17-19 (1) 19-21 (2) 21-22 (1)	06-08 (1) 19-21 (1)	*Nil*
South-east Asia	16-19 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-12 (1) 21-22 (1) 22-00 (2) 00-01 (1)	01-03 (1) 03-06 (2) 06-08 (1)	03-06 (1)
Far East	16-19 (1)	07-08 (1) 08-10 (3) 10-13 (2) 13-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	01-02 (1) 02-06 (2) 06-07 (3) 07-08 (2) 08-09 (1)	02-05 (1) 05-07 (2)* 07-08 (1)
South Pacific & New Zealand	12-15 (1) 15-16 (2)** 16-18 (3)** 18-19 (2) 19-20 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-14 (1) 14-18 (2) 18-20 (3) 20-22 (4) 22-23 (3) 23-00 (2) 00-02 (1)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1)	23-02 (1) 02-07 (2)* 07-08 (1)
Austral-asia	13-16 (1) 16-19 (2)** 19-21 (1)	01-07 (1) 07-08 (1) 08-10 (3) 10-12 (2) 12-13 (1) 17-19 (1) 19-20 (2) 20-23 (3) 23-01 (2)	00-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1)	02-04 (1) 04-07 (2)* 07-08 (1)

(Continued on page 72)

Contest Calendar

BY FRANK ANZALONE, W1WY

The DX contest activity you heard on August 21/22 was the SEANET annual contest. Announcement of this affair was not received in time to be published in last month's Calendar. There is still time however for you to submit your log if you got involved. It goes to: SEANET Contest Committee, Ismail Razak "Eshee" 9M2FK, 281-C, Jalan Pekeliling, Bukit Glugor, Penang, Malaysia. And it must be in the hands of the Committee by October 30th. Results will be announced during the 6th SEANET Convention in Djakarta on November 13/14th.

There have been a few other activities that have failed to make it in time. One sure way of *not* making the deadline is to include your announcement in the same envelope with your contest log. These are not processed for some time after they are received, and the information is not forwarded to me until some months later. To play it safe all information should be sent directly to me, to my home address, and at least three months before the date of your event. 73 for now, Frank, W1WY

Delta QSO Party

Starts: 2000 GMT Saturday, Sept. 25
Ends: 0200 GMT Monday, Sept. 27

This is the 7th annual QSO Party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) may work stations both in and outside their boundaries, others only Delta stations. The same station may be worked on each band and mode, and portable and mobile each county change.

Exchange: QSO no., RS(T) and QTH. County and state for Delta stations, ARRL section for others.

Scoring: For Delta stations, total QSO's times ARRL sections worked. (max. of 75) For others QSO's times Delta counties worked. (max. of 316) DX stations may be worked but for QSO points only.

Frequencies: C.W.—3550, 7050, 14050, 21050, 28050. S.S.B.—3990, 7290, 14290, 21390, 28590. Novice—3775, 7175, 21125, 28125.

Certificate Awards:

A. Achievement: All stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 Delta states, 4th and 5th if warranted.

C. Others: To the highest scoring station in each ARRL section and each country, 2nd and 3rd if warranted.

D. Plaques: Top scorers, in and outside the Delta division, and top portable and mobile Delta stations.

Mailing deadline October 21st to: Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180.

**14 Sherwood Rd., Stamford, Conn. 06905*

Calendar of Events

**Sept.	4-5	Albatross SSTV Contest
**Sept.	4-6	Four Land QSO Party
**Sept.	11-12	European Phone Contest
*Sept.	11-12	Pennsylvania QSO Party
*Sept.	11-12	Washington QSO Party
*Sept.	16-18	YLRL "Howdy Days"
*Sept.	18-19	VE/W Contest
*Sept.	18-20	Maryland/DC QSO Party
*Sept.	18-19	Scandinavian C.W. Contest
*Sept.	25-26	Scandinavian Phone
Sept.	25-27	Delta QSO Party
Oct.	2-3	California QSO Party
Oct.	2-3	VK/ZL/Oceania Phone
Oct.	9-10	VK/ZL/Oceania C.W.
Oct.	9-10	RSGB 21/28 MHz Phone
Oct.	15-17	Boy Scouts Jamboree
Oct.	16-17	RSGB 7 MHz C.W.
Oct.	16-17	WADM C.W. Contest
Oct.	17-18	Manitoba QSO Party
Oct.	19-20	YLRL Anniv. C.W.
Oct.	**30-31**	**CQ WW DX Phone**
Nov.	6-7	ARRL C.W. Sweepstakes
Nov.	6-7	RSGB 7 MHz Phone
Nov.	5-8	CHC/FHC/HTY Party
Nov.	9-10	YLRL Anniv. Phone
Nov.	13-14	Delaware QSO Party
Nov.	13-14	Missouri QSO Party
Nov.	13-14	European RTTY Contest
Nov.	14	Czechoslovakian Contest
Nov.	20-21	ARRL Phone Sweepstakes
Nov.	20-21	Austrian 160 Contest
Nov.	**27-28**	**CQ WW DX C.W. Contest**

*Covered last month.
**Covered in July issue.

California QSO Party

Starts: 1800 GMT Saturday, Oct. 2
Ends: 2400 GMT Sunday, Oct. 3

This year's party is again sponsored by the Northern California Contest Club. Their goal this year is to activate all 58 Cal. counties and have at least 350 W6 stations on the air.

Operating time is limited to 24 out of the 30 hour contest period. Off time must be at least 15 minutes and shown on log.

The same station may be worked once per band and mode, portables and mobiles each county change. Cal. stations may work each other for QSO points and one multiplier. DX stations for QSO points only.

Exchange: QSO no., and QTH. County for Cal., state, province or country for others.

Scoring: Two points per QSO. Cal. stations use states and VE call districts (max. of 8) worked for their multiplier. Others Cal. counties. (max. of 58)

Frequencies: C.W.—1805, 3560, 7060, 14060, 21060, 28060. S.S.B.—1815, 3895, 7230, 14280, 21355, 28560. Novice—3725, 7125, 21125, 28125. Try 10 on the hour, 15 on the half hour between 1800 and 2200 GMT.

Awards: Certificates to the Top scorers in each Cal. county, state, VE province and country, 2nd and 3rd if justified. Also to the Top scoring mobile, portable, multi-single, multi-multi and club submitting the highest aggregate score.

Include a summary sheet with your entry showing the scoring, type of entry and etc. A large s.a.s.e. will get you the results.

Mailing deadline is October 31st to: Northern Cal. Contest Club, c/o Doug Docherty, WA6DQM, 2306 Monserat Ave., Belmont, Calif. 94002

VK/ZL/Oceania DX Contest

Phone: Oct. 2-3 C.W.: Oct. 9-10
Starts: 1000 GMT Saturday
Ends: 1000 GMT Sunday

Stations in the rest of the world will consentrate on working stations in Oceania, with the emphasis on VK/ZL for their multiplier.

Rules apply to stations other than VK/ZL.

Exchange: RS(T) plus a progressive QSO no. starting with 001.

Scoring: *For Oceania:* 2 points for VK/ZL contacts, 1 point with rest of world.

Outside Oceania: 2 points for VK/ZL contacts, 1 point for other Oceania contacts.

Final Score: Total QSO points multiplied by the sum total of VK/ZL call areas worked on each band. (Single band logs also accepted)

Logs: Date/time in GMT, station worked, number sent/rec'd, band, QSO points. Underline each new VK/ZL call area worked on each band. Use a separate sheet for each band. A summary sheet showing the scoring, name and address in BLOCK LETTERS and a signed declaration that all rules and regulations have been observed.

Awards: Attractive certificates to the top all band scorers, phone and c.w., in each country and call areas of JA, W/K and the USSR. Single band awards if returns warrant.

This year the NZART will award Jubilee Plaques, phone and c.w., to the Top Scorer in each Continental area. And a Jubilee Certificate to every contestant submitting a log. (Include IRC to cover postage)

There is also a s.w.l. section. Only VK/ZL stations are to be logged. Include call of station being worked and serial number sent.

Logs must be in the hands of the Committee no later than Jan. 31, 1977. This year they go to: NZART Contest Manager, P.O. Box 489, Wellington, New Zealand, or to Jock White, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

RSGB 21/28 MHz Phone Contest

From 0700 to 1900 GMT
Sunday, October 10

It's the world working the British Isles (G, GC, GD, GI, GM, GW) on 21 and 28 MHz. Entries limited to single operator only.

Like last year the contest has been reduced to 12 hours only and the scoring system is again based on a multiplier system.

The same station may be worked once on each band for QSO and multiplier credit. Use a separate log for each band.

Dick Spenceley KV4AA, congratulating and presenting the CQ 160 Championship Plaque to Herb Schoenbohm KV-4FZ (the guy with the hair). Herb has been "Top Banana" in the CQ World Wide 160 Contest for the past 5 years, setting a World Record in 1973 with a score of 193,231.

Exchange: The RS report plus a progressive contact number starting with 001.

Scoring: Each QSO with a British Isle station is worth 3 points. Multiply total QSO points from each band by sum of British Isles prefixes worked on each band for the final score. (max. of 36 possible on each band. GB prefix does not count.)

I could find no mention of awards for overseas stations. An oversight, or poor planning?

There is also a s.w.l. section. Only British Isles stations are to be logged. Scoring is same as indicated above.

Logs should be received no later than December 6th and go to: M. Harrington, 123 Clensham Lane, Sutton, Surrey SM12ND, England.

Scouting's Jamboree-on-the-Air

Starts: 1800 Friday, October 15
Ends: 2400 Sunday, October 17
(Local Time)

This is the 19th annual worldwide Jamboree in which amateurs promote world friendship on the air. It is also a fine opportunity to introduce amateur radio to newcomers. Individual amateurs and clubs are encouraged to invite scouting groups to their shacks to QSO other Scouts. Amateurs who are interested should inform their local scout council concerning their availability for the JOTA.

Frequencies: Phone—3740, 3940, 7090, 7290, 14290, 21360, 28990. C.W.—3590, *3740, 7030, *7140, 14070, 21140, 28190. (*Novice) Also 2 and 6 meters. (Above are calling frequencies.) Listen especially for K2BSA, the National Headquarters station.

Logging Info: List all stations worked or heard in JOTA activity, time in GMT. Indicate if other station is a Scout, Scouter or has been either one. And how many Scouts or Scouters were present. Tally up the number of JOTA contacts, stations with Scouts or Scouters operators, and number who participated from your station.

Awards: The JOTA Certificate will be awarded to all participants, amateurs, Scout groups and s.w.l.s who submit a report.

Scout and Scouter amateurs are urged to participate with K2BSA in the informal nets Wednesdays from 2000 to 2300 on 3740, 3940, 7140, 7290 MHz and on Saturdays from 0900 to 1400 on above frequencies plus 14290, 21140, 21360. All local standard time. If no activity is heard start some by calling "CQ Boy Scouts."

Logs and reports for the JOTA and QSLs for K2BSA go to your National Coordinator. In the USA it is Harry Harchar (W2GND) c/o K2BSA, Boy Scouts of America, North Brunswick, N.J. 08902

WADM C.W. Contest

Starts: 1500 GMT Saturday, Oct. 16
Ends: 1500 GMT Sunday, Oct. 17

This is still a c.w. only contest but the GDR indicated that s.s.b. will also be included next year.

The same station may be worked once on each band, 3.5 thru 28 MHz. There are three classifications, single and multi-operator and s.w.l.

Exchange: DM stations, RST plus the number of their "Kreiskenner." (57905) All others, RST plus a contact number. (579001)

Scoring: Three points for each DM

1975 Contest Results
North America
OK DX Contest

XN1AW	AB	1242	WA2ZWH	21	711
WA2BZX	AB	174	W3CBF	21	66
WA1SCX	14	440	W1OPJ	21	42

VK/ZL/Oceania

C.W.		Phone	
W1EVT	5,820	W2FCR	455
W1WY	108	W4WSF	4,347
W2LWI	3,591	WA4EYR	3,197
W3TV	85	W4ORT	1,505
W4WSF	315	WB6AZK	210
W5SDO	60	W6RQZ	110
WA6EPQ	13,284	K3MNT/7	2,432
W6PLH	12,200	W8FJS	32
W6KYA	2,016	W9YWB	1,250
W6DEI	1,314	W9LKI	252
W6DGH	1,120	W9RKP	192
W6BH	522	WA2WNT/0	13,845
W7SFA	18,315	W0EEE	2,580
W7IR	12,240	WØIVS	1,120
K3MNT/7	1,008		
W9WYB	1,326	HP1KC	210
W9LKI	126	TI2WX	576
WØEEE	2,580	YS1SOD	605
		YS1JWD	1,380
VE3GCO	52		
XJ6APN	24		
VP2MB	72		

contact. Multiply total by sum of DM districts worked on each band. A district is identified by the last letter in the call, *not* by the number in the prefix. (A thru O, a maximum of 15 on each band.)

Awards: Certificates to the 1st, 2nd and 3rd place in each country. Contest QSOs may also be applied for the many GDR awards, WADM, DMCA, DMDXC, DMKK. Additional information is available from the GDR.

Logs go to: Radio Club of the GDR, Att: Contest Manager DM2ATL, P.O. Box 30, DDR 1055 Berlin, German Democratic Republic.

RSGB 7 MHz Contest

C.W.—Oct. 16-17 Phone—Nov. 6-7
Starts: 1200 GMT Saturday
Ends: 1200 GMT Sunday

Like the 21/28 MHz phone contest this one is for activity between the British Isles and the rest of the world. However a different format is used in scoring. Only single operator entries are acceptable. Phone and c.w. are separate contests.

Exchange: RS(T) report plus a progressive QSO number starting with 001.

Scoring: Stations in Europe score 5 points for each British Isle contact, those outside Europe score 15 points. In addition, all may claim a bonus of 20 points for each different B.I. country/prefix worked. (G2, GC3, GD4, GW4 and etc. a max. of 35 possible. No bonus for GB prefix.) No multiplier, just add your total QSO and bonus points for your final score.

Awards: Certificates to 1st, 2nd, and 3rd place in the UK, EU and rest of world.

There is a s.w.l. section with scoring same as above except that the prefix bonus is 50 points. Overseas log British Isles stations only.

The c.w. entry must be received no later than Dec. 15th, the phone Dec. 31st. They go to: The HF Contest Committee, c/o John Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands, England B95 5NW.

Manitoba QSO Party

Starts: 0001 GMT Sunday, October 17
Ends: 0300 GMT Monday, October 18

This is the third QSO party sponsored by the Amateur Radio Clubs of Manitoba. The same station may be worked on each band and mode, and VE4 to VE4 contacts are permitted as are 2 meter simplex.

Exchange: RS(T), name and QTH. Municipalities for VE4; state, province or country for others.

Scoring: One point per QSO. VE4's multiply total by number of US states, VE provinces and DX countries worked. Others will use total of Manitoba cities, towns, local districts, parks and etc. for their multiplier. (max. of 134 possible)

Frequencies: s.s.b. — 3770, 3905, 7195, 7230, 14190, 14285, 21245, 21355, 28600. c.w. — 3705, 7105, 14065, 21205, 28205.

Awards: Certificates to the top scorers in each province, state and DX country. Plaques to the highest scoring VE4 and out of province station. Additional awards if warranted.

The Worked All Manitoba Award is available for confirmed contacts with a specified number of Manitoba municipalities. These are issued in graduated classes from 50 to 134. A fee of $1.00 will get you a record book, forms, maps and etc. from VE4QZ.

Mailing deadline for your logs is November 12th to: Doug. Bowles VE4QZ, 1104 First Street, Brandon, Manitoba, Canada R7A 2Y4

YLRL Anniversary Party

C.W.: Oct. 19-20 Phone: Nov. 9-10
C.W.—1800 GMT Tues. to 1800 GMT Wed.
Phone:—1800 GMT Tues. to 1800 GMT Wed.

This is strictly a YL affair open to all YL's around the world. Its the 37th annual party run by the YL Radio League.

All bands may be used. Phone and c.w. are separate with separate scoring and awards.

Exchange: Signal report and ARRL section or country for DX stations.

Scoring: One point per QSO between stations within an ARRL section, and between DX stations. Two points if between DX and ARRL section stations. The same station may be worked once only regardless of band.

Multiplier is derived from the number of ARRL sections and DX countries worked. There is also a low power multiplier of 1.25 if input 150 watts or less, 300 p.e.p. if on s.s.b.

Final Score: Total QSO points × ARRL sections and countries × power multiplier if any.

Awards: 1st, 2nd and 3rd place certificates to winners in each call district and DX country. And two gold Cups, phone and c.w., to the top YLRL member in the world. There are also three special plaques for YLRL members. The Corcoran for the highest combined phone/c.w. score in an ARRL area, the Hager for the highest combined score for North and Central America, including Caribbean areas, and one for rest of the world.

Compute your score, sign your log and mail no later than November 29th to: Beth Newlin, WA7FFG, 826 W. Prince Road -06, Tucson, AZ 85705

CQ World Wide DX Contest

Phone: Oct. 30-31 C.W.: Nov. 27-28
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Rules in details appeared in last month's issue, no changes from previous years. Keep in mind that the ARRL and DARC WAE country lists and the *CQ* WAZ zone boundaries are the standards to determine your Multiplier. The latest WAE country list will be found on page 74 of the June issue.

We would much rather see the original copy of your log, but if you do recopy it make sure it stays in its original form, showing the duplicate contacts if any, but of course no credit taken. Make sure your name and address appears on the summary sheet. Your mailing address should be one that is good for at least 10 months after the contest.

It's not necesary to use official *CQ* log forms but it's desireable if possible, especially the summary sheet. A large s.a.s.e. will get you a supply.

Mailing deadline for your phone entry is December 1st, and January 15th for the c.w. section. They go to: *CQ* World Wide DX Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050. Please indicate Phone or C.W. on the envelope. ■

Touch-Tone Pad in HT *(from page 56)*

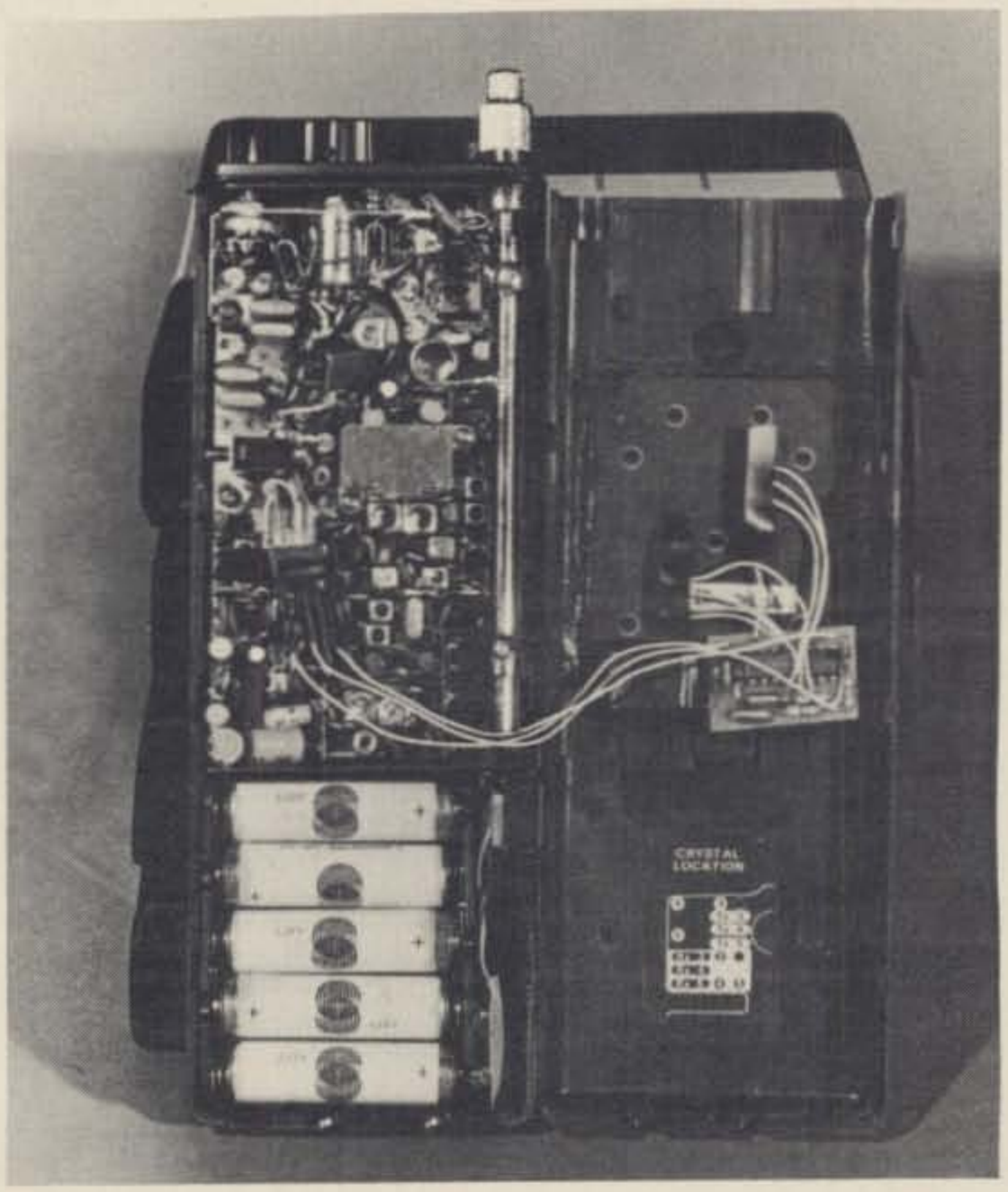
A little investigation of the Standard HT revealed about ¼ inch of space between the top of the circuit board components and the cover. This space is designed for mounting a continuous tone subaudible system that is available from Standard.

Cut an opening in the back with an X-Acto® knife or a fine saw. Do this carefully so as not to mar the surface of the case.

There is more than enough room for the tone generator IC and keypad. A Chomerics ER-21606 touchpad is mounted in an opening cut in the back of the HT and the pc board with the tone-generating components are mounted on it. Three leads provide the connections for 12 volts, audio and ground.

Construction

The MC 14410 encoder, chomerics pad, pc board



A view of the inside of the HT with the keypad and electronics mounted in the back cover.

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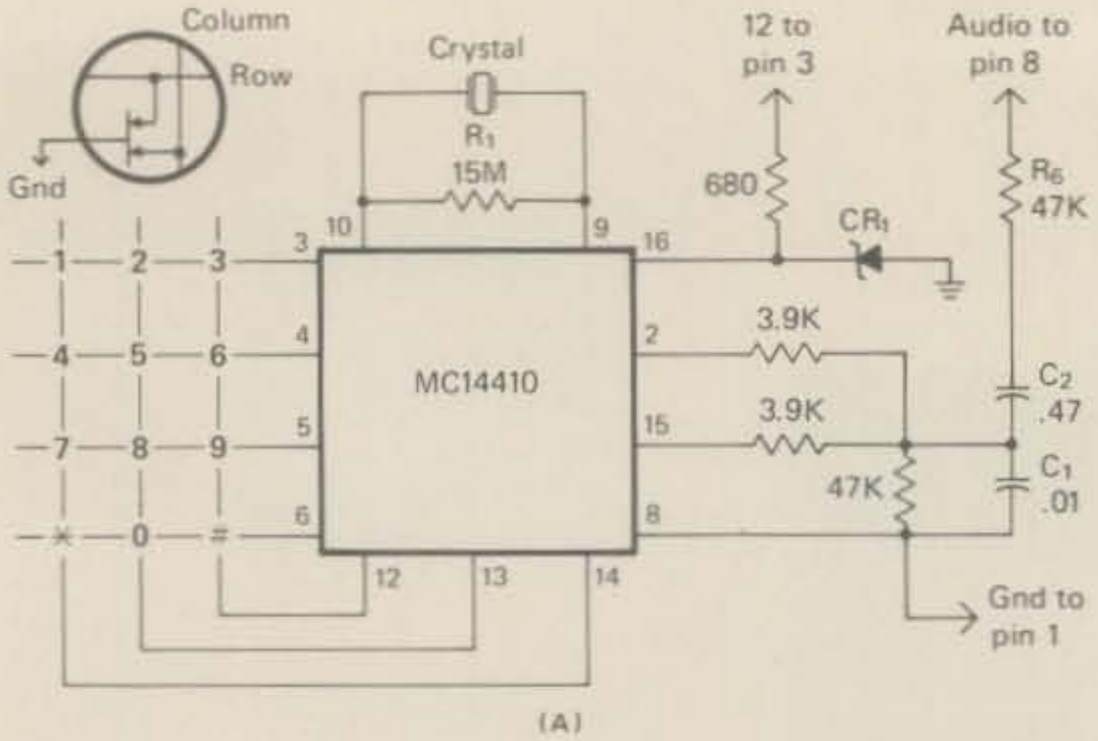
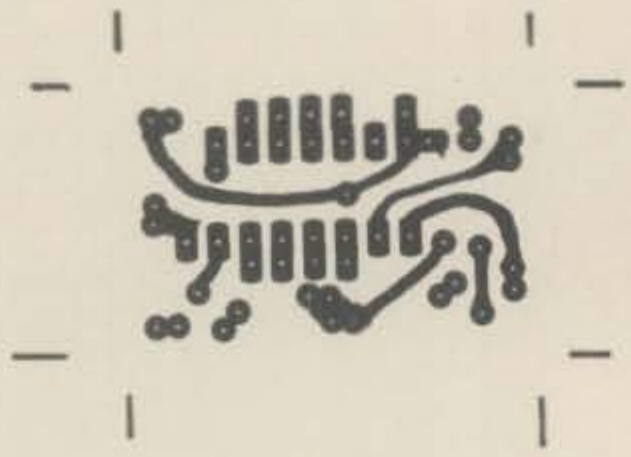




Parts List

C1 — .01 mfd
C2 — .47 mfd
R1 — 15 meg ohm
R2 — 680 ohm
R3 — 3.9K ohm
R4 — 3.9K ohm
R5 — 47K ohm (see text)
R6 — 47K ohm
IC 1 — MC 14410 Motorola IC
CR1 — 5.1 volt zener
Xtal — Crystal, 1 MHz ±0.1%, parallel mode

Fig. 1—Adding a touch-tone pad to a HT. (A) The schematic diagram for the addition. (B) Component layout for the circuit board. (C) Full sized art for circuit board shown from the foil side.

and all parts are available from Data Signal and other suppliers or a board can be constructed from any good pc material using the pattern shown in fig. 1. Solder all components except R_5 to the board using a small iron. Cut off pin 1, then mount the IC last to avoid possible static build-up on the MOS device. R_5 is used to set the deviation level for tones and will be determined later. The leads for connection to the keypad should be about 2 inches long and the 12 volt, audio and ground leads are about 4 inches long. Use small-gauge Teflon insulated wire. No connection is made to pin 11 of the IC since the fourth column of digits is not required in my location. The crystal is covered with plastic tape and "pigtailed" off the end of the board.

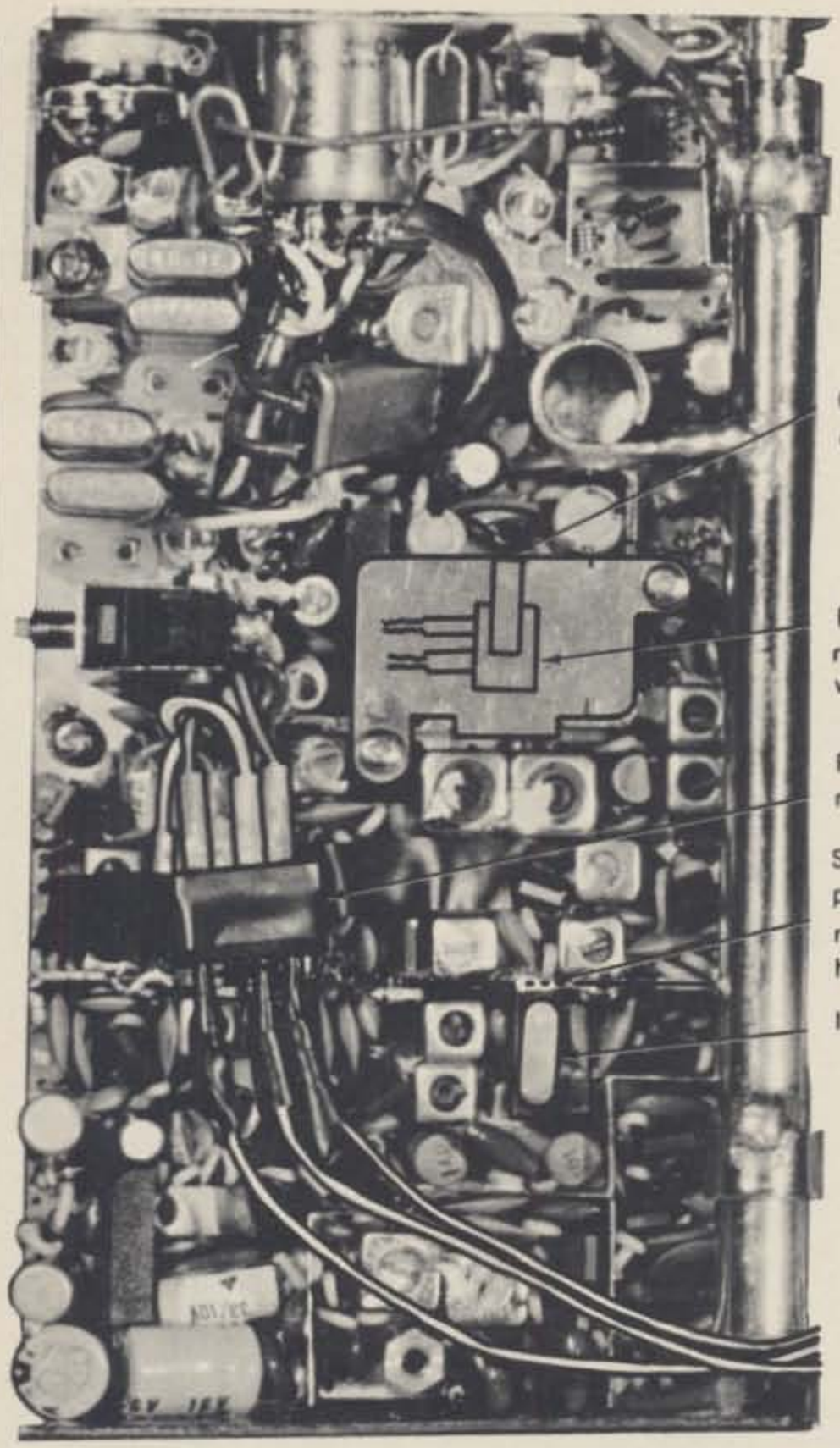
Remove the back cover from the HT and remove the nameplate by pushing it from inside of the cover. The nameplate is glued in place and may require a little prying to get it loose from the plastic case. Note that the recessed area vacated by the nameplate is almost exactly the same size as the keypad. (I wonder if they worked together on that?)

Measure the size of the keypad and cut an opening in the case using an exacto knife or a fine saw. Take your time and do this carefully so as not to mar the finish on the case. Make the opening so that the keypad fits snugly, but not so tight that it buckles. Touch-pads like this use a *conductive elastomer* to perform the switching and may short internally if they are not mounted flat. Trim the pad connecting pins to about 1/16th inch so that they will clear the components of the handie-talkie.

The four plastic mounting pins at the corners of the pad should be cut off and filed flush. The pad is then glued in the opening using epoxy or a cyanocrilate glue, such as Eastman 910. Be sure to roughen the plastic on the edges of the pad with sandpaper to insure a good bond and use as little glue as necessary. The glue can seep into the pad and make it intermittent or inoperative. Put some masking tape at the edge of the opening to prevent glue from smearing on the surface. While the glue is setting, notch the shield partition of the HT near the i.f. crystal using a cutters or a small grinding wheel. The notch is necessary to permit clearance for the pad pins and connections. If you use a grinding wheel, be sure to shake or blow out any metal particles.

After the glue has dried for 24 hours, solder the connections from the pc board to the pad and cover the pins with plastic insulation tape. The board is held in the case with double-faced adhesive tape.

Remove the existing connector from its clip and cut off the clip to allow clearance for the pad connecting pins. Move the connector to the location shown in the photo. There is enough slack in the wires to allow some change in its location.



Closeup of the PL connector showing the method of connecting the wires from the touch-tone generating board. A notch is cut in the shield partition near the crystal to provide clearance for the pad pins.

The tone encoder can be wired directly to the connector pins, but I chose to take the easy way out. Get some heavy wire or some small nails that will make a tight fit in the connector. Solder a ⅜-inch length to the end of the wires from the pc board and insulate it with tape or heat-shrink tubing. Pin 8 is mike hi, pin 3 is switched 12 volt and pin 1 is the ground connection.

Connect a 5K pot to the R_5 connections and set it for the correct deviation of the touch-tone encoder. Then disconnect the pot and measure its resistance. Solder a ¼ watt fixed resistor of the same value on the board at R_5. (If your autopatch is not too critical about tone level, substitute 100K resistors for R_3 and R_4, and a 1K resistor for R_5 and don't worry about the above step.) Carefully loop the wires and replace the back cover. Press the PTT and dial up your autopatch. This completes the modification.

I now have a handie-talkie that is still handy. The radio is no larger than it was originally and it still fits in its carry-case. Now if I could just build it into my shoe. . . . ■

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DX *(from page 59)*

Tabloid, for several years. Rod will handle the *CQ* C.W. and S.S.B. DX Awards and write every third column. As the WPX Program has grown so large in recent years we will have a separate WPX Manager effective immediately. He will be Bob Huntington, W6TCQ, an enthusiastic prefix chaser who will do a fine job with this unique award.

For those applying for WPX, send your applications to Bob Huntington at 5014 Mindora Drive, Torrance, CA 90505. *CQ* C.W. and S.S.B. Award applications go to Rod at 5632 47th. Ave. S.W., Seattle, WA 98136.

QSL Information

A6XR—Via G4CHP
ex-A9XU—To Owen Jackson, 44 Barrington Ave., Beith, Ayrshire, United Kingdom.
A35AF—c/o his home call, JR1ATU. He has left Tonga.
AP2MQ—P.O. Box 1480, Lahore, Pakistan.
C21KM—Via WA6AHF
C31JA—To HB9APJ
C31JW—c/o HB9AYX
C31JX and C31KA—Via DK9FE
CE0AE—To WA3HUP
CN8MB—c/o P.O. Box 8062, Casablanca, Morocco.
DM8FJM—Via DM2CUI
F0AOZ/FC—To DK1DY
FC2CH—c/o WA8TDY
GB2USA—Via G3AKG
HK0AA—Cards for contacts made June 2-7, 1976 go to SM3CXS. Cards for contacts made June 17-22, 1976 go to HK3DEU.
HR6SWA—c/o K3HVG.
JT0OAQ—Via UY5LK.
JW2CF—To Sigurd Solheim, N-9170 Longyearbyen, Svalbard Radio, Via Tromsoe, Norway.
JW5NM, JW7FD and JW8KT—c/o LA5NM, Box 210, N-9401 Harstad, Norway.
KC7LBH—Via WA7OBH.
KG6JFZ—To W6LZV.
KJ6DL—c/o WB5HVY.
KJ6DK—Via PSC Box 276, APO San Francisco, CA 96305.
KS6DV/KB6—To Box 1333, Pago Pago, American Samoa 96799.
P29DV—c/o W8PD.
SU1JA—Via JA0BKU.
SV0WZ—To OE3NH.
TJ1BG—c/o K4ZLZ.
VE1APY/SU—Eric Gebhardt, P.O. Box 878, Greenwood, N.S. B0P 1N0 Canada.
VK2FT/Lord Howe—May and June, 1976 contacts only to K1TZQ.
VP1MPW—Via W5QPX.
VP2DE—To F6BBJ.
VP2DM—c/o W9EED.
VP2EEE—Via K2BPP.
VP2KA—To W7OK.
VP2KJ—c/o WB2TSL.
VP2KK—Via W3HNK.
VP2LCG—To K0KJS.
VP2LCN—c/o WB9IWN.
VP2LCP, VP2LDU and VP2LGH—Via VE3FFA.
VP2LL—To W2MIG.
VP2VAN—c/o K2FJ.
VP5MA—Marilyn, c/o Postmaster, South Caicos Island, British West Indies, or to WB4LFM.
VP8MS—Via K4MZU.
VP8OL—To WB4ASV.
VR1AF—c/o W7OK.
VR3AH—Via K2BT, 75 Crestview Road, Mountain Lakes, N.J. 07046.
VR3AK—To KH6AHZ, 179 Aumoe Road, Kailua, HI 96734.
VR8A—c/o Weather Office, Funafuti, Tuvalu.
VU2GV—G.V. Sulu, Wireless Quarters, Nizamuddin East, New Delhi 110013, India.
XJ3ZZ/1—Via VE3BMV.
XW8ER—Matamoto, Box 196, Vientiene, Laos.
ZB2YL—To G3VGW.
ZD9GF—c/o ZS5SH, P.O. Box 12, Pennington, Natal, Republic of South Africa.
ZF1JH—Via WA6VNR, 3785 Mt. Blackburn, San Diego, CA 92111, **only** for contacts made April 17-30, 1976 and in November, 1974.
ZL3FM/VR1—To ZL3FM.
4S7JK—c/o DL7JK.
5B4YK—Via OH2BCA.
5X5NK—To DL1YW.
5W1AB—c/o W6DAB, 12661 Byron Ave., Granada Hills, CA 91344.
9J2BO—Brian Otter, Box 142, Mpika, Zambia.
9J2GF—Gordon, c/o Box 786, Ndola, Zambia.
9Q5QR—Tony Jeuken, P.O. Box 10061-Airport, Kinshasha 24, Zaire Republic.
9Q5SW—Via JA8JN.
9V1SQ—To VE3FFA.

73, John, K4IIF

Propagation *(from page 65)*

Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-11 (2) 11-13 (3)** 13-15 (4)** 15-16 (3)** 16-17 (2) 17-18 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-23 (1)	18-21 (1) 21-22 (3) 22-02 (4) 02-04 (3) 04-06 (2) 06-08 (1)	20-22 (1) 22-02 (2) 02-04 (3)* 04-05 (2)* 05-06 (1)
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-10 (1) 10-11 (2) 11-13 (1) 13-17 (2)** 17-18 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-23 (1)	20-21 (1) 21-01 (2) 01-03 (1) 03-04 (2) 04-06 (1)	22-00 (1) 00-04 (2)* 04-05 (1)
McMurdo Sound, Antarctica	16-18 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	01-03 (1) 03-05 (2) 05-07 (1)	03-06 (1)

CQ Short-Skip Propagation Chart
September & October, 1976
Local Daylight Savings Time At Path Mid-Point

Band (Meters)	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	10-20 (0-1)	10-20 (1)	10-20 (1-0)
15	*Nil*	10-20 (0-1)	08-10 (0-1) 10-17 (1-2) 17-22 (1)	08-10 (1) 10-17 (2) 17-19 (1) 19-22 (1-0)
20	*Nil*	08-10 (0-1) 10-12 (0-2) 12-15 (0-3) 15-17 (0-2) 17-22 (0-1)	08-10 (1-2) 10-12 (2-4) 12-15 (3-4) 15-17 (2-4) 17-20 (1-3) 20-22 (1-2) 22-08 (0-1)	08-09 (2-1) 09-10 (2) 10-14 (4-2) 14-16 (4-3) 16-17 (4) 17-18 (3-4) 18-20 (3) 20-22 (2) 22-00 (1) 00-06 (0-1) 06-08 (1)
40	08-10 (0-2) 10-12 (1-3) 12-16 (2-4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)	08-10 (2-3) 10-12 (3) 12-16 (4-2) 16-18 (3) 18-20 (2-4) 20-22 (1-4) 22-00 (0-3) 00-03 (0-2) 03-06 (0-1) 06-08 (0-2)	08-10 (3-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-22 (4) 22-00 (3-4) 00-03 (2) 03-06 (1-2) 06-08 (2-3)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-00 (4-3) 00-06 (2-3) 06-08 (3-2)
80	07-09 (3-4) 09-12 (4) 12-19 (4-3) 19-22 (4) 22-04 (3-4) 04-07 (2-3)	07-09 (4-2) 09-12 (4-1) 12-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-04 (4) 04-06 (3-4) 06-07 (3)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-04 (4) 04-06 (4-2) 06-07 (3-2)	07-09 (1) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (2) 06-07 (2-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

ALASKA
September & October, 1976
Openings Given In GMT

Eastern States	21-23 (1)	18-21 (1) 21-23 (2) 23-01 (1)	08-12 (1)	Nil
Central States	21-00 (1)	19-22 (1) 22-00 (2) 00-03 (1)	08-13 (1)	09-12 (1)
Western States	20-21 (1) 21-23 (2) 23-01 (1)	17-18 (1) 18-21 (2) 21-01 (3) 01-02 (2) 02-04 (1)	08-11 (1) 11-14 (2) 14-16 (1)	11-14 (1)

HAWAII
September 15-October 15, 1976
Openings Given In Hawaiian Standard TIME

Eastern States	11-14 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-16 (2) 16-18 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1)	19-20 (1) 20-23 (2) 23-02 (1)
Central States	08-12 (1) 12-15 (2) 15-16 (1)	05-06 (1) 06-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	17-19 (1) 19-21 (2) 21-02 (3) 02-04 (2) 04-05 (1)	19-20 (1) 20-01 (2)* 01-03 (1)
Western States	08-10 (1) 10-12 (2) 12-14 (3)** 14-15 (2) 15-17 (1)	06-07 (1) 07-10 (3) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	17-18 (1) 18-19 (2) 19-00 (4) 00-03 (3) 03-06 (2) 06-07 (1)	18-20 (1) 20-22 (2)* 22-03 (3)* 03-04 (2)* 04-06 (1)

#See "How To Use Short-Skip Charts" in box at the beginning of this column.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.
*Indicates best time for 160 Meter opening.
**Indicates best time for 10 Meter opening.

Math's Notes *(from page 47)*

resistor and f is cut off thereby stopping the count.

In this manner described this month and last we have tried to show how the experimenter can get some "hand-on" experience with LS1 chips. It is the hope of this author that when devices with such unlimited uses are made available, amateurs and experimenters will pick up the ball so-to-speak, and develop them into useful circuits to further the hobby.

If you do wish to pursue this further I would suggest you write to National Semiconductor Corp., 2900 Semiconductor Drive, Santa Clara, California 95051 and ask for a MM5736 data sheet and a copy of applications note AN112 as well as AN119.

Until next month then,

73, Irwin, WA2NDM

Bibliography

1. MM5736 Data Sheet
2. AN 112
3. AN 119 all National Semiconductor

QRP *(from page 45)*

News

Things ought to be picking up for QRPp DXers on the high bands, and for the guys who like 40 and 80. We haven't had any applications for QRPp DXCC for several months now. How are things going? I'd like to devote the bulk of some future columns to reports from our readers. So, if you've been active and would like to share some of your experiences and savvy with our readers, take pen in hand. Also, I'd really appreciate (and so would our readers!) pictures of fellow QRPp'rs, so let's get on the ball! Remember that the big *CQ* WW DX bash this fall will have a special, separate QRPp section if current plans work out. So get planning on that effort right now. Let's have a good showing. It is high time some "biggie" organization like *CQ* (or *QST?* naw, never) recognized that QRPp operators have been participating in these contests that everyone assumes are reserved for the QRO guys. At least thirty entries first time out! Until next month, then.

73, Ade, K8EEG

Antennas *(from page 41)*

"Well", interrupted Pendergast, "It seems to me that the fellows using twin whips on automobiles don't gain a thing. In fact, they loose signal strength to the sides of the automobile".

"That's right", I agreed. "And look at the situation with 10 feet spacing. No improvement in gain, and the signal strength is down about 6 dB off the sides of the vehicle. Even so, most operation of the big trucks — speaking from a communication point of view — is up and down the highway, so the figure-8 pattern is probably a good thing. It helps to reduce interference a bit from stations to the sides of the road. And it improves the poor pattern of a single whip mounted on a big semi-rig. But all the use of twin whips on an automobile does is to inflate the ego of the user, as far as I can tell."

Pendergast sighed heavily. "I guess I'll stick to 2 meter f.m. and my nineteen-inch whip antenna".

"Don't sell the vertical antenna short", I answered. "I received a very interesting note from Dave, W0FCL, in Great Bend, Kansas. Dave has been working with 40 meter vertical antennas and has evolved a very simple and effective version of the well-known phased vertical array (Figure 9). The verticals are spaced a half-wavelength apart and are fed in phase to produce a broadside pattern (into and out of the page). He uses a TV mast for one vertical and an aluminum tubing mast for the second vertical. They are guyed with nylon rope and sit on soft drink bottles. He recommends plenty of radial wires.

"The feed system is quite simple. Each antenna is matched at the base with an inductor (as is done with my mini-Quad loop) to provide a feed point impedance of 50 ohms. Then, each antenna has an equal-length section of 50 ohm line (A), followed by a quarter-wavelength section of 70 ohm line (B). This works out to 23 feet for either RG-59/U or RG-11/U. The 70 ohm transformer steps the impedance of each antenna up to about 98 ohms. A coaxial T-connector is used to connect the antennas in parallel, dividing the circuit impedance by two to about 49 ohms. From this point, a 50 ohm line is run to the station equipment.

"It is easy to tune up the system. Adjust each antenna by itself to provide a base impedance of 50 ohms. This is done with the aid of a dipmeter and Antennascope. A noise bridge may be used, if desired. Antenna length and matching coil turns are adjusted together. As a final check a 50 ohm line may be run separately to each antenna and the antenna adjusted for minimum s.w.r. on the line. Once this is accomplished, the antennas are parallel connected through the 70 ohm transformers and T-connector.

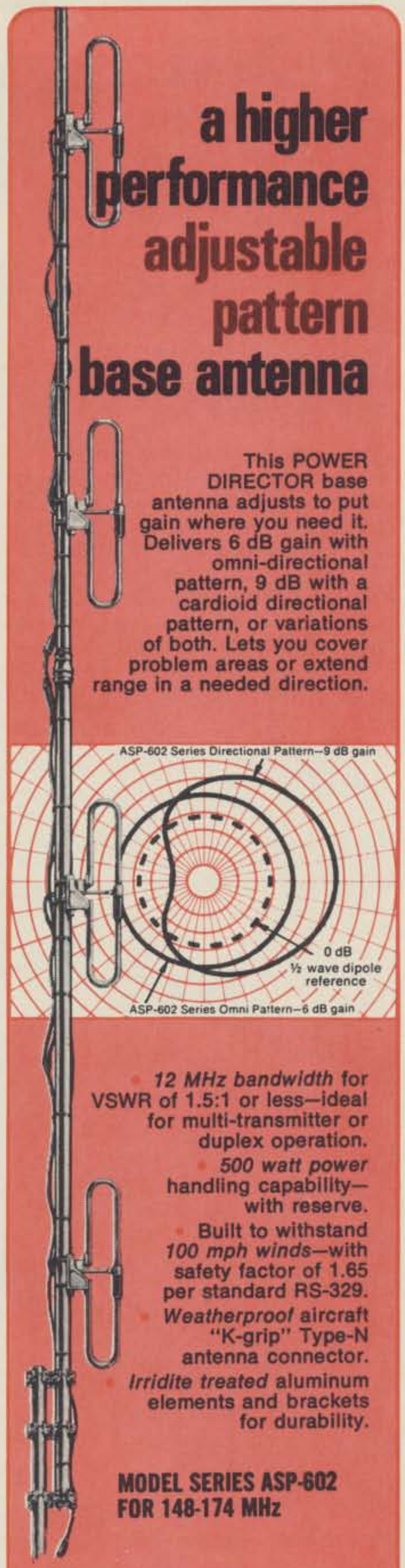
It should be possible to reach 1.2-to-1 s.w.r. when the antennas are working together. In this case, the antennas are resonated at 7.06 MHz for full band coverage".

Pendergast asked, "How do they compare against a simple dipole?"

"Dave says the two antennas outperform his inverted-V dipole at distances over 600 miles. He has placed the whips to give east-west coverage".

"Well, I *know* the antenna works", responded my friend. "I've heard W0FCL and he suffers no pain in working DX".

"That's right," I replied. "It's hard to be loud on 40 meters, and I take my hat off to the fellow who has the energy, time and space to put up a good antenna system. I think I'll just go home and sulk about it for a while, since all I have is a wire running out to a tree in the rear of the yard!" ■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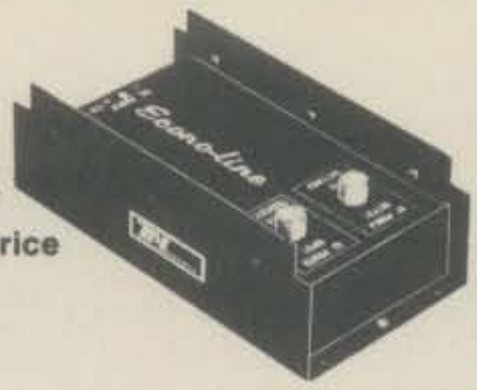

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CQ Reviews: the MR-2 *(from page 48)*

veloped in the second i.f., consisting of five amplifier stages prior to the ratio detector. This design approach reduces the susceptibility of the front end to cross-modulation. Overall sensitivity of the receiver is good with .8 microvolts required to produce 20 db of quieting.

The small 1½ inch speaker produces a reasonable listening level with about a quarter watt of drive. For use in a noisy environment you would want to utilize the ear phone provided.

There are no trimmers for the crystals, so it is recommended that crystals be purchased from Henry Radio to insure the proper tolerance. Squelch adjustment is made internally when the Ni-Cads are fully charged. When the squelch opens with no signal applied, you know it is time to re-charge the Ni-Cads. The receiver averaged eight to ten hours of continuous use on a full charge.

The MR-2 is not only handy for carrying around, its performance is good enough to be utilized as the receiver portion of a compact fixed station. ■

CQ Reviews: the TV-502 *(from page 35)*

Kenwood transceivers. With some other transceivers you may find it necessary to make some adjustments to achieve the desired a.l.c. action.

A protection circuit for high s.w.r. is also included and performs well. At an s.w.r. above 2 to 1 the circuit reduces drive to the pre-driver stage (Q_4) by biasing the gate of Q_3, the r.f. amplifier directly following the balanced transmit mixer stage in the r.f. unit.

The manufacturer rates the spurious radiation at better than −60 db. The level achieved during testing varied with the transceiver used to drive the transverter and ranged from −50 db to about −61 db. The service manual for the TV-502 provides a great deal of information concerning the tuning of the various stages and traps in the transmitter section to obtain minimum spurious radiation. I would suggest the purchase of this manual to augment the operator's manual, if you are a do-it-yourself type.

The level of third order products during modulation varied somewhat, depending on the driving transceiver and the modulating frequencies used. On the average, third order products were down by close to 30 db below a single tone of a two tone test. This method of measuring third order product distortion is a bit arbitrary and can be quite misleading when you consider that an amateur s.s.b. transmitter is normally modulated by the human voice, which is a complex waveform, often displaying a highly asymmetrical wave shape. The basis for that statement would require several pages of explanation, which I will save for a feature article at some future date. It should be sufficient to state here that the TV-502 is competitive with other good

s.s.b. rigs when it comes to third order product distortion.

The a.c. supply in the TV-502 will work from either 220 v.a.c. or 120 v.a.c. and is switch selectable from the back of the unit. A separate power cord for operation from a d.c. source of 12 to 16 volts is included, but I believe the TV-502, TS-520 combination would be a bit much to hang under the average automobile dash. For fixed operation it's the smart, economical route to travel. ■

Antenna Noise Bridge *(from page 29)*

Normally one doesn't need to calibrate the variable capacitor in terms of actual reactance values. It usually suffices to note that if the capacitor has to be turned in more from its center zero setting to get a noise minimum that the impedance being measured has a capacitive reactive component. Likewise, if the capacitor has to be turned out more from the center setting the load has an inductive reactive component. However, the bridge can be calibrated for accurate reactive readings if desired for such purposes as stub calculations. Calibrate the X_c "side" of the capacitor by using accurate fixed capacitors paralled with a 50 ohm dummy load. The capacitors can range in value from 10 to 68 pf. The other X_L "side" of the capacitor is marked off as a mirror image of the X_c side.

The applications shown in figures 1 and 2 are the most common for the noise bridge but its uses need not be limited to just those. It can function as a wide-band noise source for signal injection during trouble-shooting in a.f. or r.f. circuits and as a noise source for the alignment of r.f. circuits. By forming resonant circuits with one known element, the unknown value can be determined. Small r.f. coil values can be measured directly and accurately once the X_L/X_c variable capacitor is calibrated. In short, by knowing how to use this relatively inexpensive test instrument one can perform measurements that normally would require far more expensive and elaborate equipment. ■

Making A Contest Fun *(from page 24)*

What do I feel like? Well, not too bad. All I have to do is sit on my chair like a telegraph officer with mail-horn cap on my head and watch that the machinery runs all right. My new problem is to find a clever enough computer to replace myself between the headphones and the keyboard. Another thing I am working on is to change s.s.b. into a digital format so I can run phone contests too . . .

So in the next contest if you tell your life story to OH2BH you might not get any comments back. Please be very quick since you're talking with the "machine gun" and it might just send you an electricity bill.

See you in the next contest. ■

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SWAN: 175 Xcvr, A.C. & D.C. Pwr. Supply, Mobile Antenna, Manual, Mike. Bargain at $100.00, WA2PAT, 14 Wickford Ave., Trenton, N.J. 08618.

SWAN 1200X, Linear Amplifier, New, in sealed carton, $250. Russell, 19680 Mountville Dr. Maple Hts, OH 44137.

WANTED: Mint Collins 32S, 516F-2, and 312B-4. T. Gannon, 291 S. Lorraine Dr., Mary Esther, FL, 32569.

WANTED: Wm. B. Duck Radio Catalogue no. 14 also Brass Binding posts - Buy or trade. Glen Angle, Clear Lake, SD 57226.

WANTED: Pre 1936 QST's. Have several 1945-1975 QST issues and 1952-1973 CQ issues for sale or trade. E.F. Sabo, WA7VSD, 2417 - 1st Ave. W., Seattle, WA 98119.

FERRITE BEADS: Lowest price in the country. 15 for $1.00 and 50 cents for P&H. Includes spec. sheets. Todd Gorlin, 4829 Buchanan St., Hollywood, FL 33021.

DRAKE: RV-4, Mint $85.00. Heath HW-32A, $75. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

WANTED: Hallicrafters H.A.1 electronic keyer. Will trade Heath R.F. Load rated 1 kw w/ calibrated watt meter. Or make reasonable offer on R.F. Load. FOR SALE: Eico 717 electronic keyer for $35.00. WB7AVO, 4417 E. Ash, Las Vegas, NV 89110, (702) 452-3907.

MUST SELL: SB-303 with AM & CW Xtals, SB-620, SB-600, HW-16 & HG10B VFO, Matchbox. All mint, Best offers. Mark Gibson 3 Fifth Ave., Sea Girt, N.J. 08750.

HEATH SB-102, AC P/S and Spkr. and mike $450.00. Swan SW-140, No P/S $50. Ron Hughes, WA6WTF, 2990 Irwindale Dr. San Jose, Ca. 95122.

WANTED: Kenwood 820, KLM PA-10-70B or TPL 802 or 1202 amplifier Newtronics CGT-144 2-meter mobile antenna. F. Kauppi, Rt. 1, Box 171, Gilbert, MN 55741.

WORLD QSL - DX - Send Cards to: Philip Kurland, P.O. Box 1822, Glendale, AZ 85301

WANTED: 1945 issues CQ; QST Jan-April and July-Sept. 1916; Collins 70K2 PTO; Pse airmail Jock ZL2GX, 152 Lytton, Gisborne, N.Z.

FOR SALE: TCS Radio Equipt. 12/24 v.d.c. or 110 Vac manual. Offer - Craig Hi-Low-UHF Scanner $100.00 w/xtals (9). J. Pilgram, 6123 Premiere, Lakewood, CA 90712.

GRIDIP METER - Barker & Williamson Model 600, Good, $55.00. H. Anderson, 816 No. Cedar St., Colorado Springs, CO 80903.

WANTED: HRO RECEIVERS, SBE 34, HW-18, YAESU SP-401 Speaker to match FTDX 560. WA8MLV, 1008 Englewood Dr., Parma, OH 44134.

WANTED: for Hallicrafters HT-37 Internal VOX Relay Good Condx., WA7WXQ, Doug, North Star Route, Torrington, WY 82240.

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ROBOT SSTV MONITOR, Videograph, Viewfinder, 256 lines $250. 701 Bubbling Well, Glendora, CA 91740. (213) 335-7355.

WANTED - ARRL Handbooks 3rd thru 10th editions. State price. Donald, 6059 Essex St., Riverside, CA 92504. (714) 687-5910.

SALE: RBC - 2 Type CRV-46148 receiver w/ PS $100.00. Will deliver up to 200 mile radius Local only. E.M. McFadden, P.O. Box 248, Glenns Ferry, ID 83623.

SALE: U44BBT w/schematic, Repair p.s., $135. Heath HW-29 sixer $25. C.F. Milazzo, 716 Calhoun Ave., Bronx, N.Y. 10465.

ATLAS 210X with noise blanker $525. Mobile Mount $25. Swan Model 45 $75. W6BKY Box 1633, Palo Alto, CA 94302.

COLLINS Mechanical filters; 3.2,3.2,7.0 with mounting 3 for $30.00. Collins 100Khz crystal $5.00. Joystick and Joymatch $25.00. Dynamic Microphones $10.00. W7BIF, 107 Wyoming, Boulder City, NV 89005.

SELL: SX111 Hallicrafter Recv. with matching speaker $140. Gail West, 234 Sunrise Village, Homestead, FL 33030. (305) 245-0196.

DRAKE T-4XC & AC-4 $475. C. Duval, K8HWW, 33727 Brownlea, Sterling Hts., MI 48077.

SELL: 2 New Motorola Mobile 2 M. Antennas with cable, connectors, and instructions, $7.00 ea. Want: HM-102 or HM-2102. B. Nastoff, 320 W. 56th Place, Merrillville IN

SELL: National NC-270 $70. Hallicrafter, HT-40 $35. SBE-34 xcvr with codater $275. All for $350. Raphael Barnard, 3682 Harper Ave. Bronx, N.Y. 10466. (212) 324-4981.

PAIR 813 1-K.w Linear 0 Bias 2000 Volt Plate Voltage $250.00 & Shipping Chgs. or Come and Get it. William Worland, 1324 Dayton Rd. C-18, Greenville, OH 45331.

WANTED: Drake Remote VFO FV-3 Mint Condx. A. Sturko, Box 72, QSL Bureau, Ft. Smith, NWT Canada.

LIMARC FLEA MARKET, October 10, Rain Date Oct. 24, N.Y. Institute of Technology, Rte 25A, Old Westbury, L.I. Buyers $1.25 Sellers $2.50 per space. Talkin on 25/85 & 52.

MEDICAL: Any licensed amateur radio operator in the medical or para-medical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906. (617) 233-1234.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO, issues at 20 cents each (including USA shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

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SALE: Atlas 210B complete with 110/220 V AC Console. Excellent condition. $550 PP. With mods (R.I.T., etc.) as per my Feb. CQ article and latest factory updates. Great rig. Only reason for sale is that am now in CN8 and CN8 will not issue license. Schultz, K3EZ Box "L", FPO New York, 09544.

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FOR SALE: Filament transformer 110V to 6.3 v.c.t. at 10 amps, $5.00, Raytrack 30 amp. filament choke $4.00, Bud type H-9116 chrome handles $3.50, Raytrack 6 meter plate choke on 3/4" steatite form $2.50, 3 pairs Raytheon circuit board mounting brackets, 1 1/2", 2", 2 1/2", $2.00, 3 Raytheon knobs (2-MS91528-3F 2B, 1-MS91528-IF2B) $1.75. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

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FOR SALE: Vol I, No. 1 Jan. 1945 CQ Magazine $15.00. Al Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington N.Y. 11050.

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SELL, SWAP: 6 - 813's; Hallicrafter S-95 Hi-Band Monitor - Anyone have info on James Research Oscillator Monitor Mk. 2. Larry, WB9AZQ, Box 144, Robinson, IL 62454.

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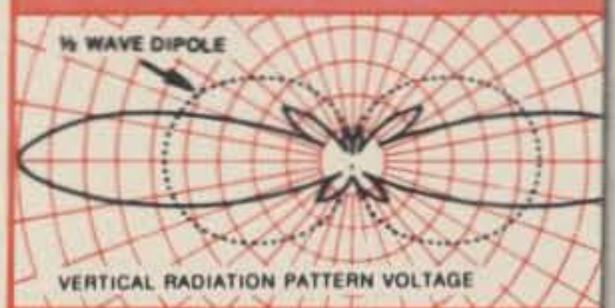

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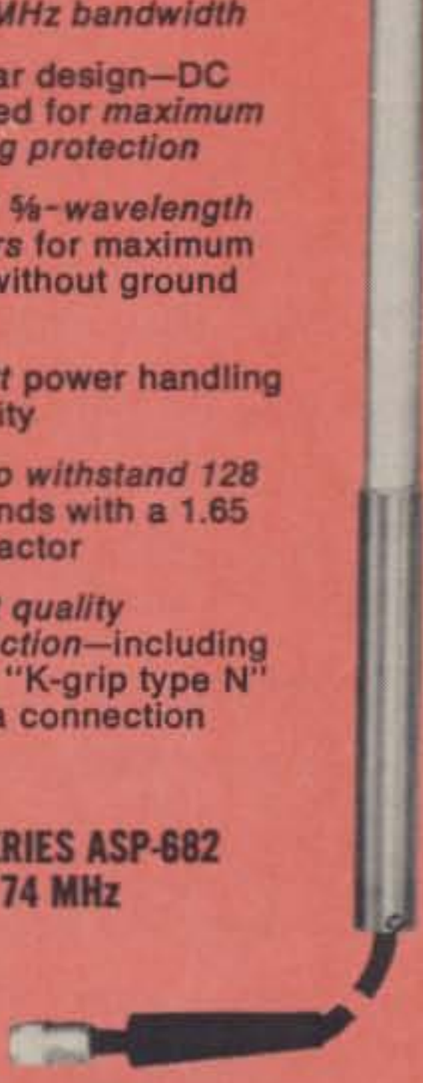

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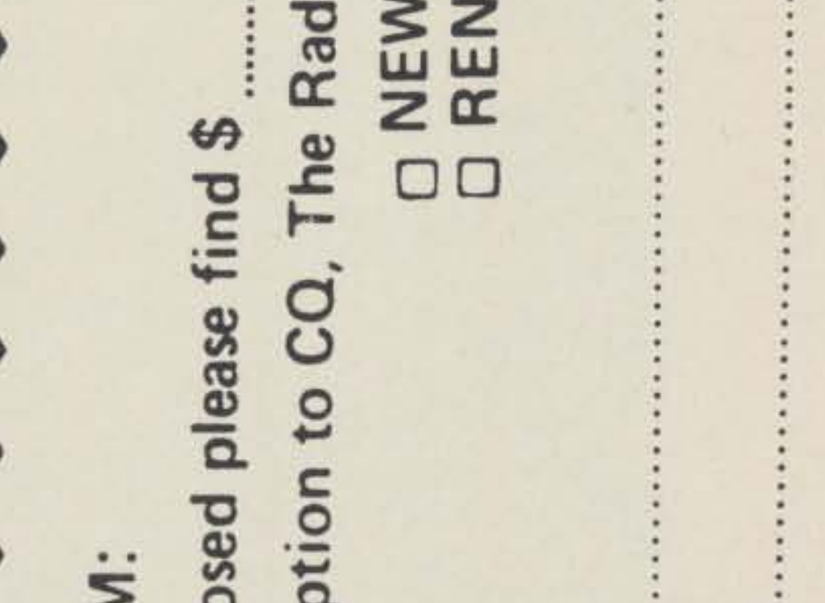

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